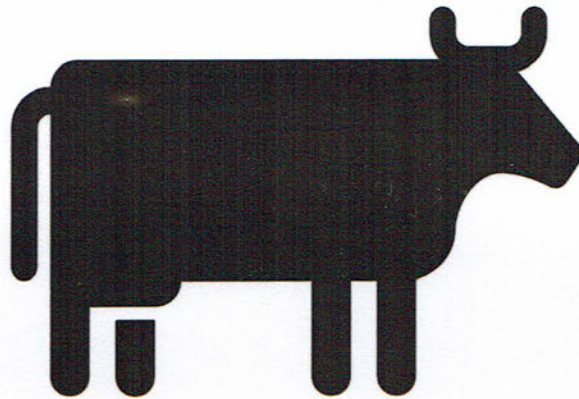


Four Brothers Dairy

Nutrient Management Plan



Nutrient Management Plan Prepared For:
Andy, Clem, Lawrence Fitzgerald

Four Brothers Dairy

Certified Planner:
Matthew Thompson, P.E.
Owner, AgTec
(208) 731-8640

Producer Signature: _____

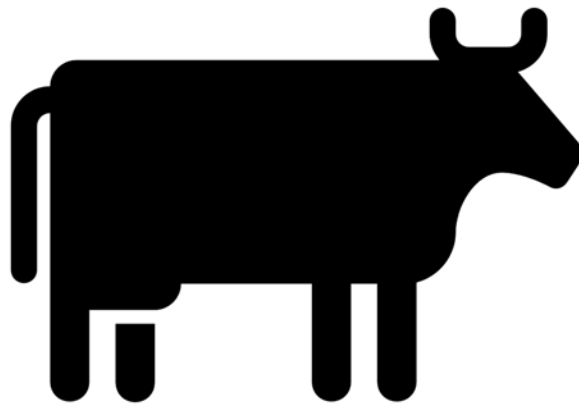
Certified Planner Signature: _____

A handwritten signature in black ink, appearing to read "Matthew W. Thompson", written over a horizontal line.



Four Brothers Dairy

Nutrient Management Plan



Nutrient Management Plan Prepared For:
Andy, Clem, Lawrence Fitzgerald

Four Brothers Dairy

Certified Planner:
Matthew Thompson, P.E.
Owner, AgTec
(208) 731-8640

Producer Signature: _____

Certified Planner Signature: _____

Contents

Dairy Contact Information	4
Resource Information Summary	4
Manure Production Summary	4
Manure Storage Summary	5
Planner Information	6
Record Keeping Requirements	6
Production Area Requirements	6
Land Application Area Records.....	7
Facility Description.....	20
Resource Concerns.....	20
Parlor Descriptions.....	20
Waste System Descriptions and Runoff Areas	22
Barn 1 Area	22
Heifer Area.....	22
Barn 3 Area	25
Barn 2 Area	25
Barns 4 & 5 Area	26
Storage and Handling Plan Requirements	26
Storage Operations and Maintenance	27
Manure Application Rates	27
Manure Sampling and Laboratory Analyses (Testing).....	30
Cropping Plan	31
Land Application Site Assessment	32
Soil Sampling Protocol	32
Annual Nutrient Budgeting.....	33
Third Party Export	33
Requirements for the Transfer of Manure, Litter, and Process Wastewater.....	35
Mortality Management.....	35
Chemical Handling & Management	36
RECORDS, REPORTING, MONITORING, AND NOTIFICATION	37

A. Records Management.....	37
1. Record Keeping Requirements for the Production Area	37
2. Record Keeping Requirements for the Land Application Area.....	38
Appendix A – Phosphorous Risk Index.....	40
Appendix B – Facility Production Area Sizing Analysis	83
Appendix C - Crop Specific Guidelines	105
Appendix D – U of I Manure Sampling Protocol CIS 1139.....	120
Appendix E – U of I Soil Sampling Bulletin 704 revised.....	125
Appendix F – Feeding Effects on Manure Nutrient Content.....	134
Appendix G – Emergency Management Plan.....	150
Appendix H – NRCS Soils Info.....	159
Appendix I – Pond Evaluations	406

PRODUCER SUMMARY

Dairy Contact Information

The following table contains the contact and location information for the Dairy facility and the owners and operators.

Facility Name	Four Brothers Dairy		
Facility Address	425 N 250 W		
Operator Information	Andy, Clem, Lawrence Fitzgerald	Home Phone	(b) (6)
Mailing Address	425 N 250 W, Shoshone, ID, 83352	Barn Phone	(000) 000-0000
		Cell Phone	(208) 308-4716
Manager Information	Andy, Clem, Lawrence Fitzgerald	Home Phone	No Data
Manager Address	425 N 250 W, Shoshone, ID, 83352	Cell Phone	(208) 308-4716
County	Gooding		
GPS	Barn 1	43.0014 deg N	114.4554 deg West
	Barn 2	43.0061	114.4532
	Barn 3	43.0102	114.4493
	Barn 4	43.0142	114.4588
	Barn 5	43.0070	114.4554

Resource Information Summary

Resource Concern:	Surface Water
Soil Conservation District:	Gooding
Watershed Basin:	Big Wood
Hydrologic Unit Code:	17040219
Stream Segment:	Wood River

Manure Production Summary

Table A-1 - Manure Groups - NRCS AMWFH 2008 Values

EMP Output	N Retained	% Manure	N - lbs	P205 lbs	K2O lbs	Raw tons	@ 35% moist.
Lagoon	14%	4.9%	32,880	100,432	130,549	18,542	
Solids	28%	95.1%	1,297,852	1,930,634	2,509,584	356,448	65,806
Annual Nutrients Produced			1,330,733	2,031,065	2,640,133	374,990	65,806
			-	-	-	-	-
Total Nutrients Available			1,330,733	2,031,065	2,640,133	374,990	65,806

Manure Storage Summary

Table A-2 - Container Storage Summary

Container Name	Volume (ft3)	Storage Period (Days)	Length	Width	Depth	Freeboard	Slope
B1 Separator Pond	35,991	180	225.0	72.0	4	1	3
B1 Lagoon 1	173,115	180	330.0	166.0	4.5	1	2
B1 Lagoon 2	1,252,387	180	423.4	300.0	15	2	2.7
Calf Berm	144,937	180	600.0	250.0	2	1	2
SW Pump Pit	8,661	180	77.0	67.0	4.5	2	2
B2 Settling	51,588	180	200.0	100.0	4.33	1	3
B2 Lagoon 1	544,920	180	420.0	200.0	8.5	1	2
B2 Lagoon 2	242,222	180	290.0	175.0	6.5	1	2
B2 East 1	706,324	180	391.8	370.0	6.5	1	3
B2 East 2	594,475	180	396.3	286.0	7.1	1	3
B2 East 3	213,624	180	310.5	224.0	4.5	1	3
B2 East 4	77,243	180	332.9	165.0	2.5	1	2
Commod Collect Berm	26,384	180	700.0	36.0	2.5	1	3
B3 Pond 1	234,168	180	512.0	172.0	4		
B3 Pond 2	370,211	180	361.0	172.0	8	1	2
B3 Pond 3	202,929	180	335.0	169.0	5	1	2
B3 Pond 4	1,082,680	180	682.0	335.0	7.15	2	2
B3 Old Flush	90,805	180	222.0	120.0	5	1	2
B3 Compost Pond	451,985	180	449.1	280.0	5	1	3
Pen 20 Pond	220,501	180	340.0	180.0	5	1	2
B4 East Sep Cell	49,608	180	316.0	64.0	4	1	2
B4 West Sep Cell	37,572	180	282.0	56.0	4	1	2
B5 North Sep Cell	54,861	180	225.0	95.0	4	1	2
B5 South Sep Cell	213,467	180	475.0	84.0	9	1	2.5
B4 Pond 1	1,003,656	180	677.0	280.0	7	1	3
B4 Pond 2	704,632	180	920.0	400.0	3	1	3
B4 Pond 3	1,603,413	180	780.0	331.0	8	1	3
B4 Pond 4	1,066,812	180	477.0	424.0	8	2	2
Pen 40-1	378,523	180	353.4	300.0	5	1	3
Pen 40-2	226,385	180	254.0	215.0	6	1	3
Pen 40-3	369,700	180	416.0	208.0	6	1	3
Pen 36	368,985	180	479.5	174.0	6.5	1	3.5
B4 Compost Runoff Pond	1,359,818	180	723.2	500.0	5	1	3
Pantone	453,364	180	400.1	260.0	6	1	3
Buckway	838,661	180	393.1	270.0	11	1	3
B4 Heifer Runoff Pond	252,225	180	251.0	240.0	6	1	3
Andys Pond 1	62,620	180	174.0	67.2	13	1	2.3
Andys Pond 2	564,529	180	318.0	180.0	14	1	2

*B1,B2 etc are Barn 1, Barn 2 abbreviations etc.

Planner Information

Name:	Matthew Thompson
Address:	1993 Tamarack Loop, Twin Falls ID 83301
Phone Numbers	
Office:	(208) 731-8640
Cell:	(208) 731-8640
Fax:	No Data
Certification #:	1021

Record Keeping Requirements

Production Area Requirements

The production area must be operated in accordance with the additional measures and records specified below:

a. **Visual Inspections.** There must be routine visual inspections of the CAFO production area. At a minimum, the following must be visually inspected:

- i. Weekly visual inspections of all storm water diversion devices, runoff diversion structures, and devices channeling contaminated storm water to the wastewater or manure storage structures;
- ii. Daily visual inspections of all water lines, including drinking water and cooling water lines;
- iii. Weekly inspections of the manure, litter, and process wastewater impoundments, storage and containment structures. The inspection will note the level in liquid impoundments as indicated by the depth marker in Section II.A.2.b in this section;

b. **Depth Marker.** All open surface liquid impoundments must have a depth marker that clearly indicates the minimum capacity necessary to contain the runoff and direct precipitation of the 25-year, 24-hour rain fall event. Install a depth marker in all open wastewater or manure storage structures or the last structure in a series of connected structures. The depth marker must clearly indicate the minimum capacity necessary to contain the runoff and direct precipitation of the 25-year, 24-hour rainfall event for each pond.

c. **Corrective Actions.** Any deficiencies found as a result of the daily and weekly inspections must be corrected as soon as possible.

d. **Mortality Handling.** Mortalities shall not be disposed of in any liquid manure or process wastewater system and must be handled in such a way as to prevent the discharge of pollutants to surface waters of the United

e. Record keeping requirements for the production area. The maintenance of complete on-site records documenting the implementation of all required additional measures and corrective actions listed above must be maintained for a period of five years.

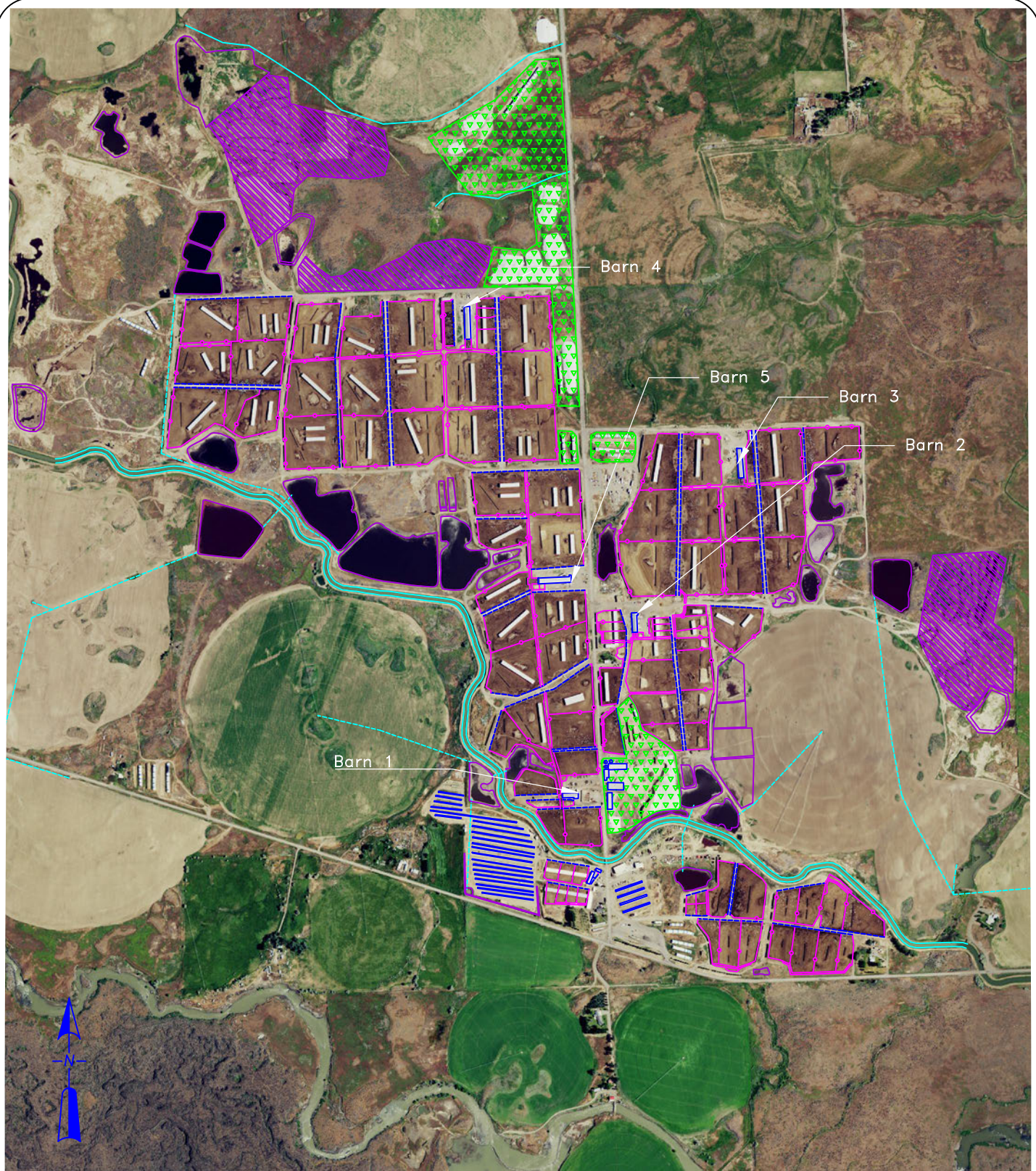
Land Application Area Records

For CAFOs where manure, litter, or process wastewater is applied to land under the control of the CAFO owner/operator, the NMP required by Section III of this permit must include the following requirements:

1. ***Nutrient transport potential.*** The NMP must incorporate elements in Section III.A.2.f based on a field-specific assessment of the potential for nitrogen and phosphorus transport from the field.
2. ***Form, source, amount, timing, and method of application.*** The NMP must address the form, source, amount, timing, and method of application of nutrients on each field to achieve realistic production goals, while minimizing nitrogen and phosphorus movement to surface waters.
3. ***Determination of application rates.*** Application rates for manure, litter, or process wastewater must minimize phosphorus and nitrogen transport from the field to surface waters in accordance with the Section III.A.2.h.
4. ***Site-specific conservation practices.*** Identify appropriate site-specific conservation practices to be implemented, including as appropriate buffers or equivalent practices, to control runoff of pollutants to waters of the United States in accordance with Section III.A.2.f.
5. ***Protocols to land apply manure, litter or process wastewater.*** Establish protocols to land apply manure, litter or process wastewater in accordance with site specific nutrient management practices that ensure appropriate agricultural utilization of the nutrients in the manure, litter or process wastewater in accordance with Section III.A.2.h.
6. ***Manure and soil sampling.*** Manure must be analyzed at least once annually for nitrogen and phosphorus content in accordance with Section III.A.2.g.i. Soil must be analyzed annually for nitrogen and phosphorus content in accordance with Section III.A.2.g.ii. The results of these analyses must be used in determining application rates for manure, litter, and process wastewater;
7. ***Inspection of land application equipment for leaks.*** Equipment used for land application of manure, litter, or process wastewater must be inspected periodically for leaks;
8. ***Land application setback requirements.*** Unless the permittee exercises one of the compliance alternatives of this section as provided below in (a) or (b), manure, litter, and process wastewater may not be applied closer than 100 feet to any down-gradient

surface waters, open tile line intake structures, sinkholes, agricultural well heads, or other conduits to surface waters.

- a. Vegetated buffer compliance alternative. As a compliance alternative, the CAFO may substitute the 100-foot setback with a 35-foot wide vegetated buffer where applications of manure, litter, or process wastewater are prohibited.
 - b. Alternative practices compliance alternative. As a compliance alternative, the CAFO may demonstrate that a setback or buffer is not necessary because implementation of alternative conservation practices or field-specific conditions will provide pollutant reductions equivalent or better than the reductions that would be achieved by the 100-foot setback. Alternative conservation practices can include practices that are designed in consultation with a Professional Engineer licensed in the state of Idaho. Alternatively, an adequate demonstration may include the use of site-specific data using a tool such as the Idaho Phosphorus Site Index and associated implementation of alternative conservation practices recommended as a result of this tool.
9. ***No Dry Weather Discharge.*** There shall be no dry weather discharge of manure, litter, or process wastewater to a water of the United States from a CAFO as a result of the application of manure, litter or process wastewater to land areas under the control of the CAFO. This prohibition includes discharges to waters of the United States through tile drains, ditches or other conveyances, and irrigation return.
10. ***Prohibition on Land Application to Frozen, Snow-Covered and Saturated Soils.*** The land application of manure, litter, or process wastewater must not occur when the land application area is:
 - a. Frozen and/or snow-covered soils, or
 - b. When the top two inches of soil are saturated from rainfall, snow melt, irrigation, or when current or predicted weather can produce such conditions.



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FILE NAME: SITE PLAN050818.DWG

Full Complex

4 Brothers Dairy

SCALE: 1" = 1320'

SHOSHONE -- LINCOLN

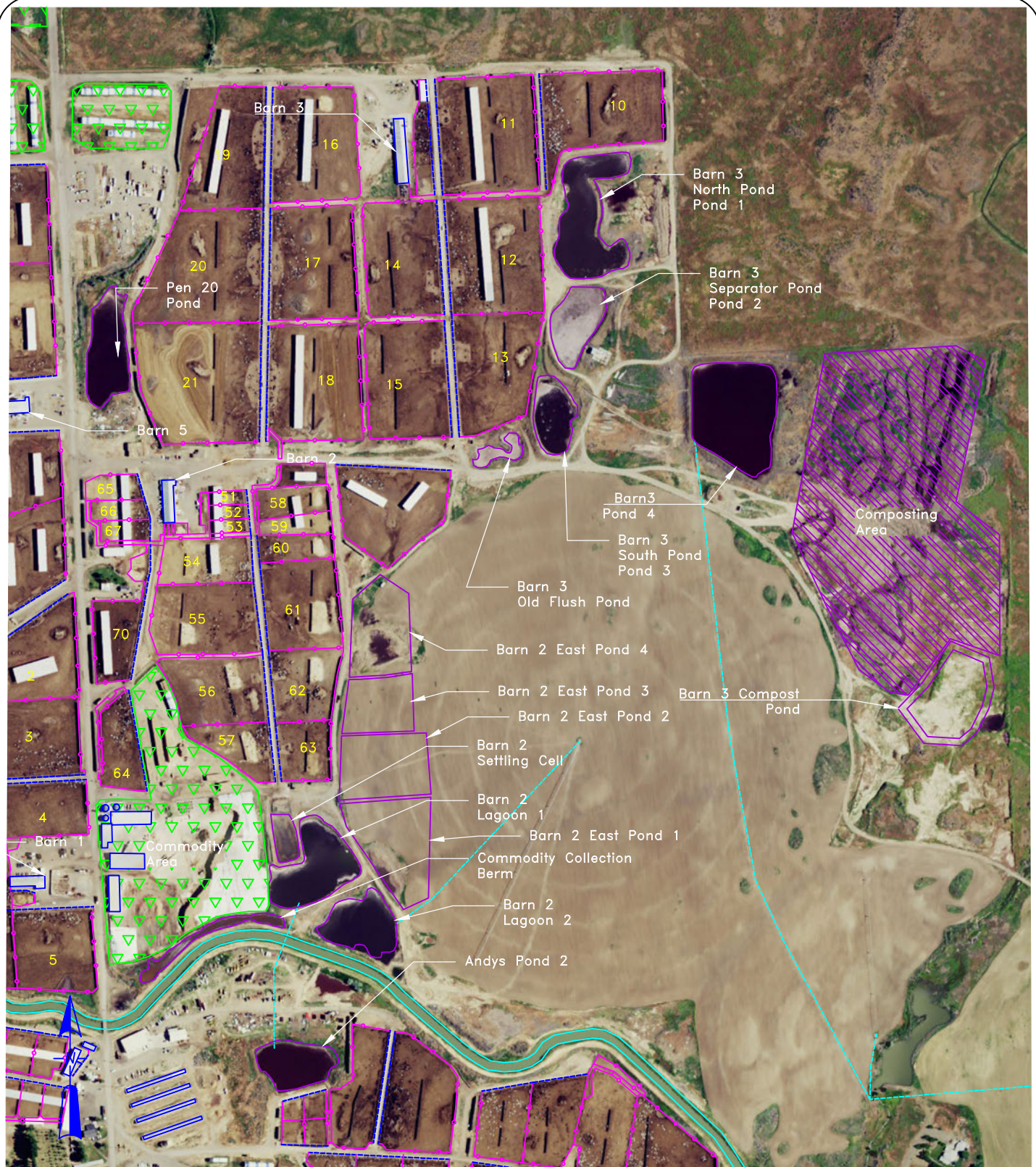
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Barn 3 and 2
4 Brothers Dairy

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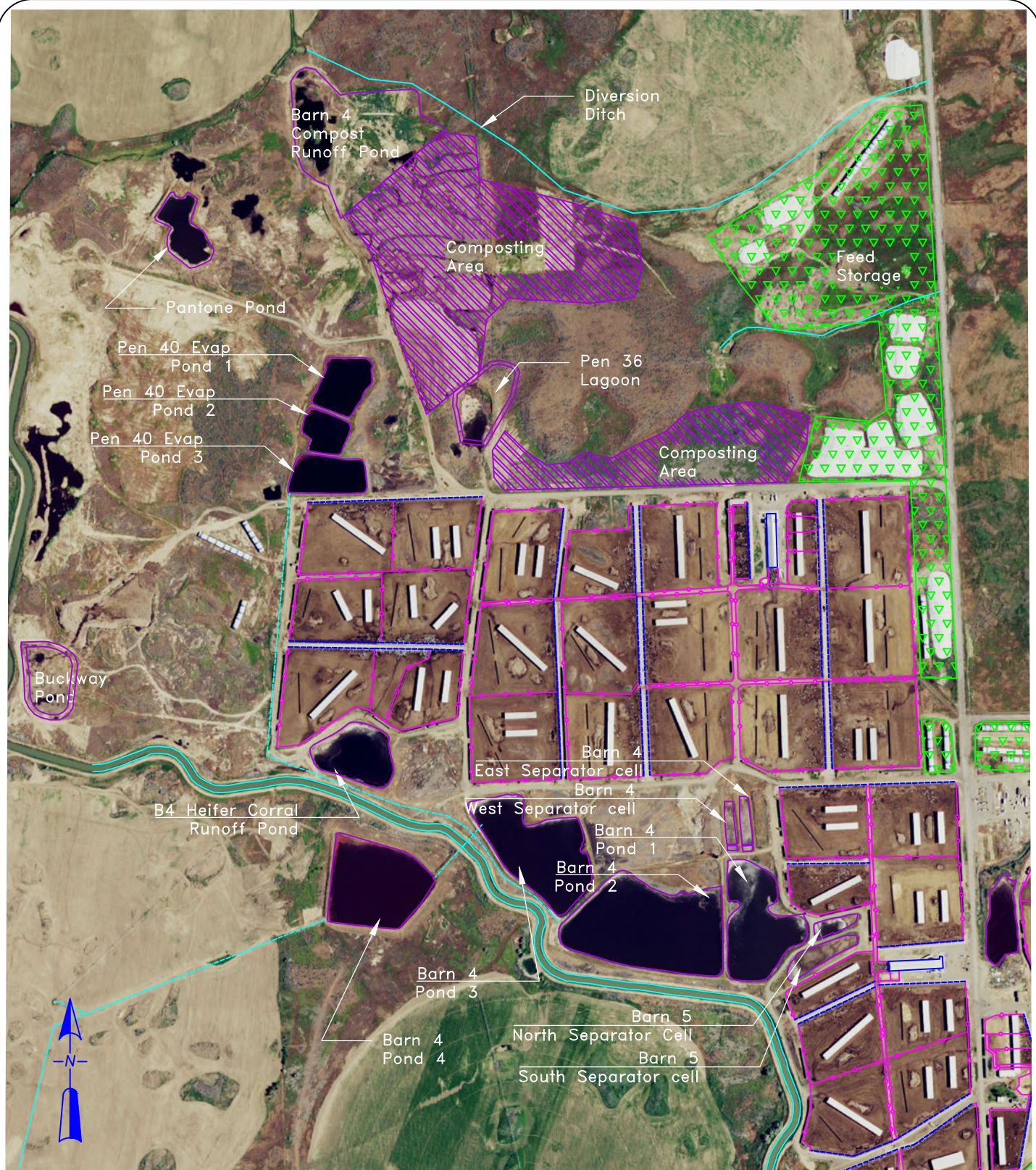
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FILE NAME: SITE PLAN101215.DWG

Barns 4 and 5
4 Brothers Dairy

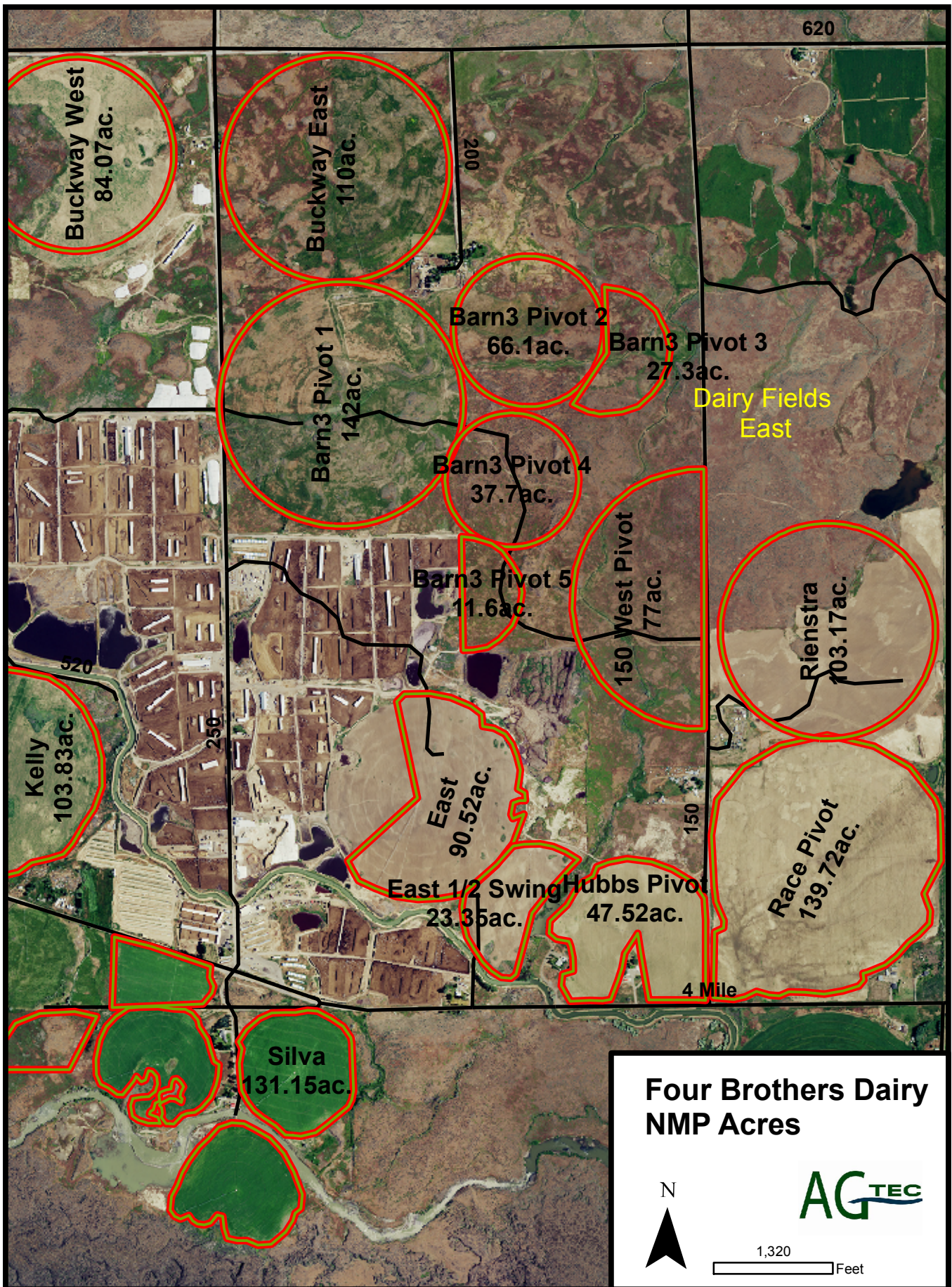
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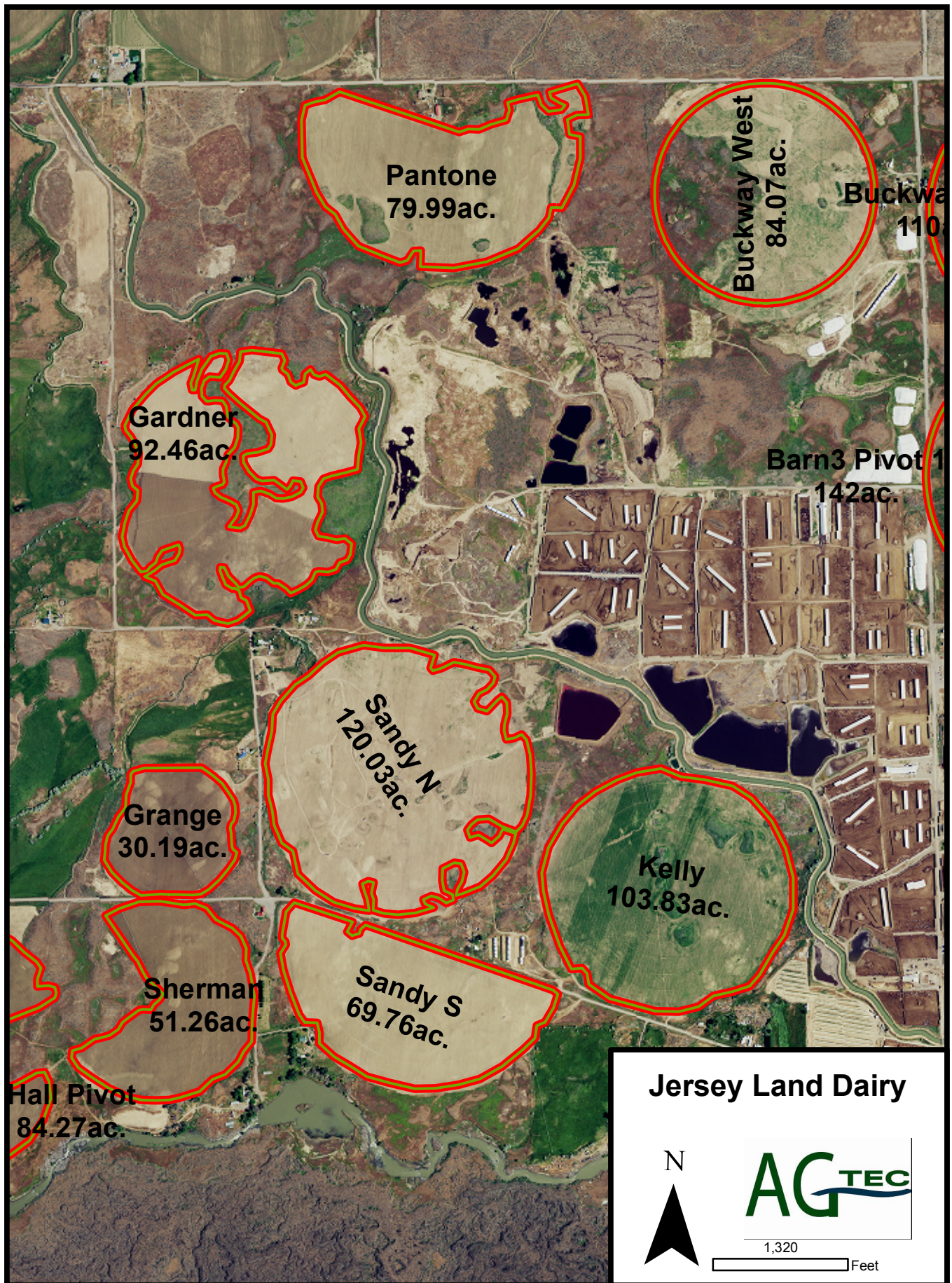
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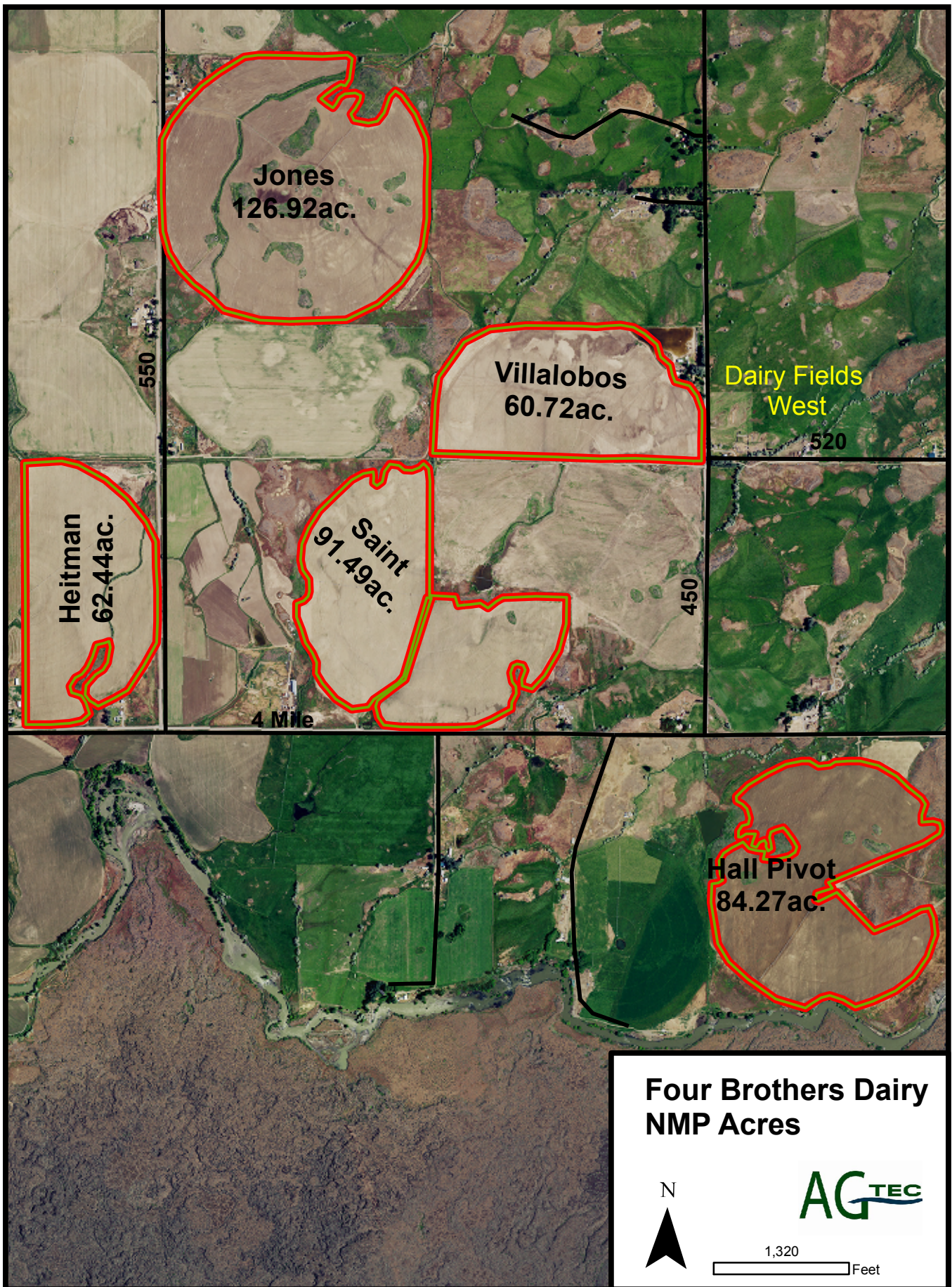
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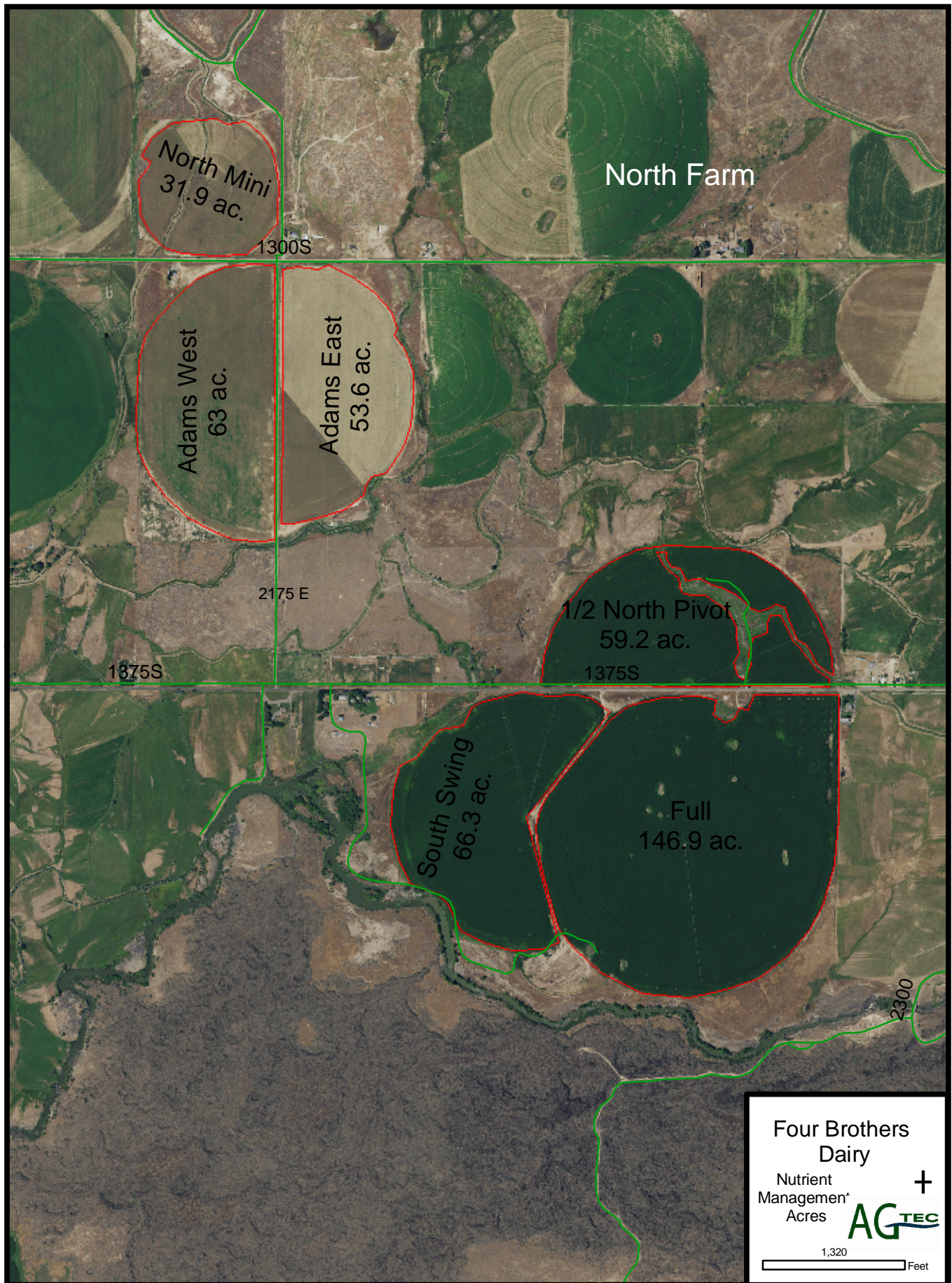
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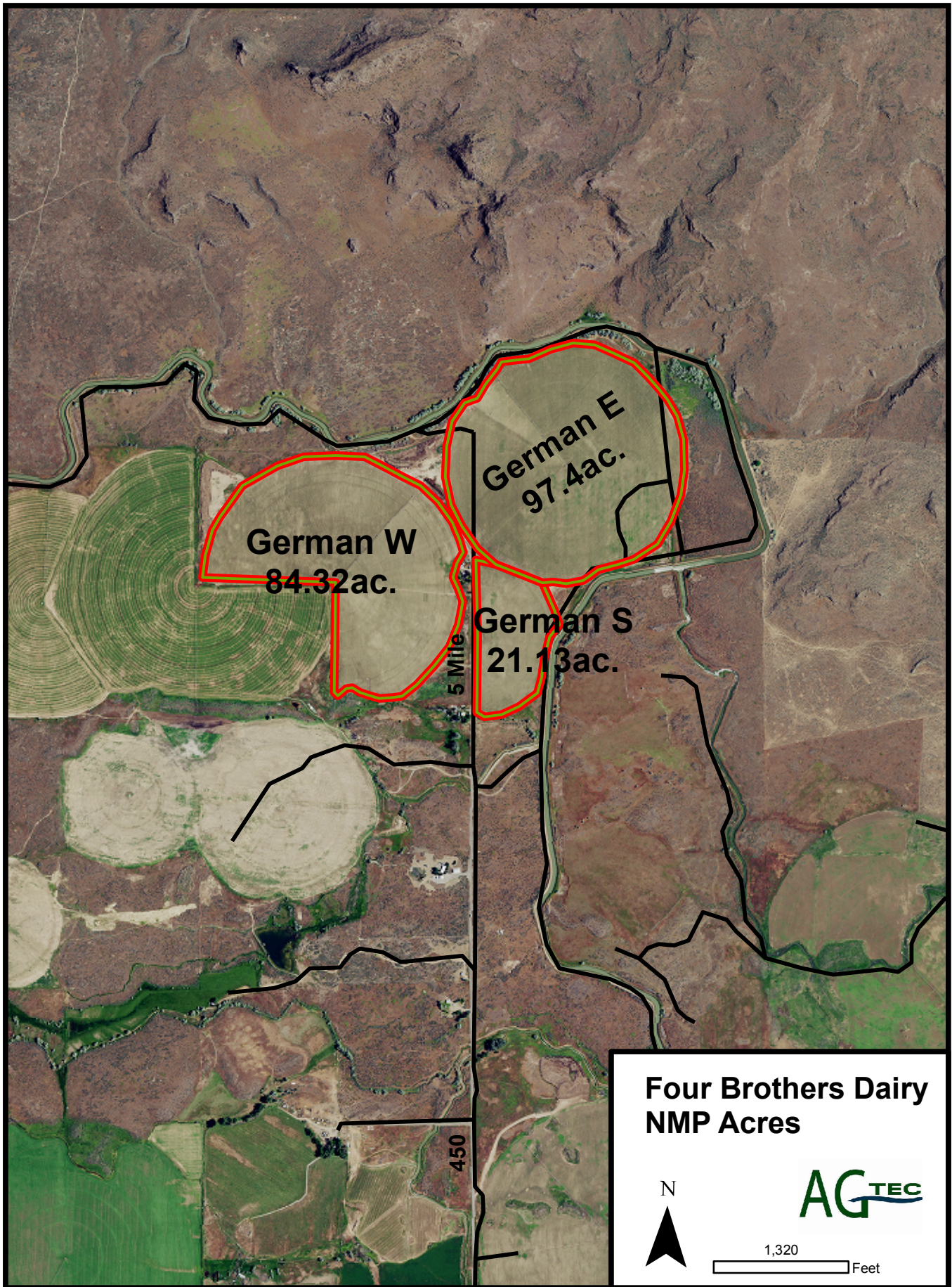
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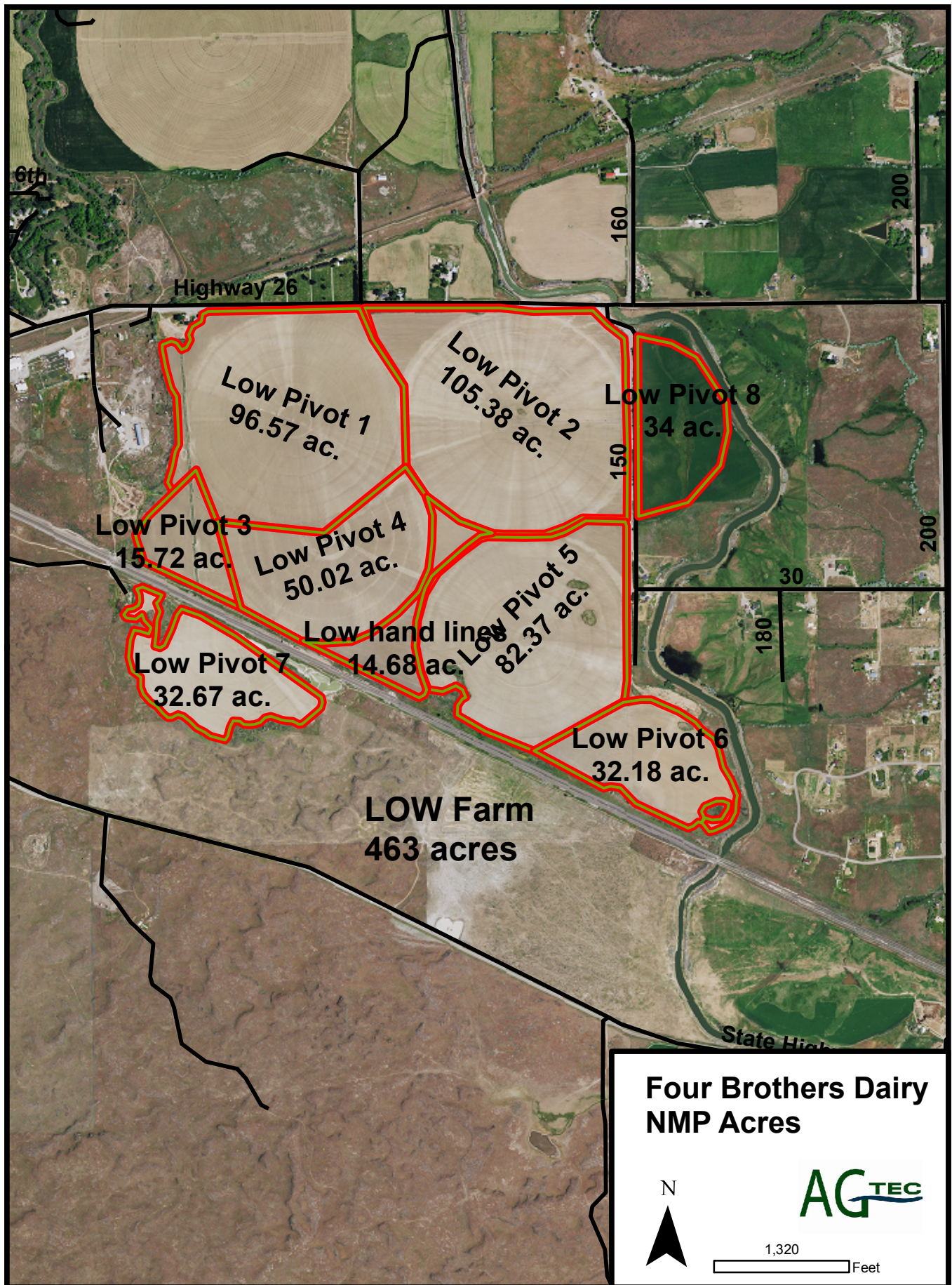


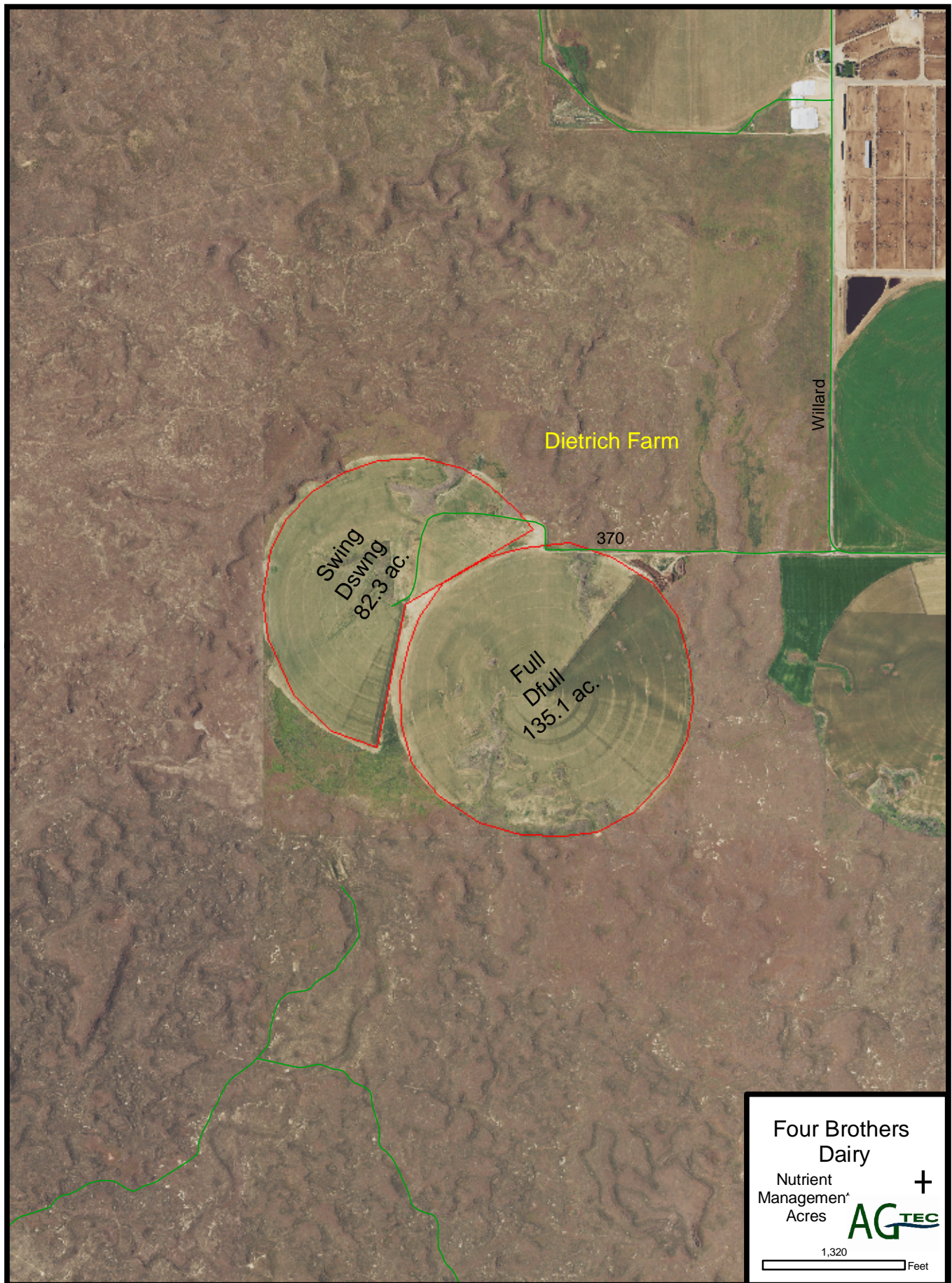












Facility Description

Four Brothers Dairy is an existing dairy operation located at 425 N 250 W Shoshone, ID 83352. The dairy is owned and operated by Andy, Clem and Lawrence Fitzgerald. They are currently milking approximately 11,500 cows with 1200 dry cows and an additional 200 bulls and 9,750 head of replacement calves, bulls & heifers. All the cows, bulls, and heifers will be housed in open lots. The mature cows will weigh approximately 1300 lbs, the bulls 1500 lbs. The replacement calves and heifers were broken into 5 groups with bottle calves averaging 200 lbs, weaned heifers weighing 400 lbs, open heifers weighing 500 lbs bred heifers weighing 850 lbs and the replacement bulls weighing 650 lbs. These are average weights by group. The calves will be housed in hutches or covered sheds. The facility contains approximately 25% jersey or crossbreds which yields the weighted average of 1300 lbs for mature cows. The Nutrient Management Plan was designed for these proposed animal numbers.

Resource Concerns

The facility is in the Big Wood Hydrologic Unit #17040219 near the Big Wood River. This stream segment is water quality limited for Bacteria, Dissolved Oxygen, Flow Alteration, Nitrates, Nutrients, and Sediment.

The primary resource concerns on the facility is surface water quality. Although all fields are sprinkler irrigated, runoff water from the fields has the potential to flow into drainages that will carry it to the canal or river.

Liquid waste is currently plumbed to the Silva Fields pivots. The Kelly and East pivots and the Buckway pivot also receive liquid waste. The Sandy North and Pantone are planned to be incorporated into the liquid waste system this NMP cycle. The East 1/2 swing and Hubbs pivot are also considered to be added if needed this cycle. The facility sold and traded a few fields and added some new ground immediately north of the dairy. The ground was surface irrigated pastures mostly and pivot irrigation will be added over time to develop this ground. These are the Buckway East, the barn3 pivots and the 150 West Pivot.

Currently there are no areas located on the facility where animals have direct access to surface water. Animals confined at the CAFO must not come into direct contact with waters of the U.S.

Parlor Descriptions

There are 5 dairy parlors on the facility. The commercial use for each parlor was determined using the following information. All parlors use plate coolers using 2 gallons of water for each gallon of milk cooled. A glycol chiller is used to further chill the milk to appropriate storage

temperatures. Clean water use is recycled to the water storage tank and reused for parlor cleanup and for cattle drinking. All parlors are manually washed down using a pressure hose in the parlor and holding pens. There are no back flush or deck spray systems in any of the parlors.

Parlor 1- Double 20 Herringbone Parlor with 1600 cows milked up to 3 times per day. There are 2 bulk tanks at the parlor with 7,000 gallon capacity each. There is currently around 4 hrs of down time per day at the parlor. The pipelines are cleaned with 4 cycles of 125 gallons. The bulk tanks are each picked up daily and cleaned using 900 gal per tank. The parlor is washed between milking using a 30 gpm hose for 40 minutes.

Parlor 2 -Double 16 Parallel parlor with 1200 Cows being milked 3 times per day. There is 1 silo for milk storage and 1 bulk tank for calf milk storage. The silo stores 8,000 gallons of milk and the bulk tank 1,500 gallons. Both tanks are cleaned each day using a combined 1100 gallons. The pipelines are cleaned using 4 cycles of 100 gallons. The parlor and holding pen are washed after each milking using two 30 gpm hose for 20 minutes.

Parlor 3- Double 40 parallel parlor with 3000 cows being milked 2 times per day. There are 2 bulk tanks with 8,000 gallon capacity each and a 20,000 gallon silo. Two of the tanks are cleaned each day using a combined 1800 gallons per day. The pipelines are cleaned using 4 cycles of 150 gallons. The parlor and holding pen are washed after each milking using two 30 gpm hose for 30 minutes.

Parlor 4- Double 40 parallel parlor with 3500 cows being milked up to 3 times per day. There are 2 silos with 20,000 gallons of storage each. These are cleaned roughly 1.5 times per day using an average of 2250 gallons per day. The pipelines are cleaned 3 times per day using 4 cycles of 150 gallons. The parlor and holding pen are cleaned after each milking using two 30 gpm hoses for 20 minutes.

Parlor 5 - Double 30 parallel parlor with 2200 cows being milked 3 times per day. There is a 8,000 gallon capacity bulk tank and a 20,000 gallon silo. There is one tank cleaned each day using 1100 gallons. The pipelines are cleaned using 4 cycles of 125 gallons each milking. The parlor and holding pen are cleaned after each milking using two 30 gpm hoses for 20 minutes.

The liquid waste system for each of the parlors utilizes a gravity earthen separator or separators followed by a series of wastewater storage ponds. Wastewater from these ponds is land applied to facility owned farm ground generally before planting and after harvest. Barns 4 and 5 utilize an evaporative pond system to handle the parlor water from these barns. The Fitzgeralds farm approximately 3,065 acres that are utilized for

manure application. All excess manure is exported to the 3rd party recipients listed in the plan. Adequate acreage should be available for the application of waste generated on the facility.

Waste System Descriptions and Runoff Areas

The waste and runoff control systems for each parlor or runoff area will be described below. The facility has been broken into 5 runoff control areas. Each of these areas has ponds associated with it for the storage of parlor process water and runoff. These areas are broken out below and the mapping of these areas is shown on the map titled 'Runoff Areas' in this section. The parlor use, runoff volumes and pond storage capacities are shown on the AGTEC Lagoon Design sheet for each area in Appendix R. This spreadsheet tool was developed using Idaho Animal Waste Management (IDAWM) Software data and methodology. Each of these estimates include 5 years of sludge accumulation in the lagoon system and precipitation on the lagoon surface and the direct addition of parlor manure to the lagoon system.

Barn 1 Area

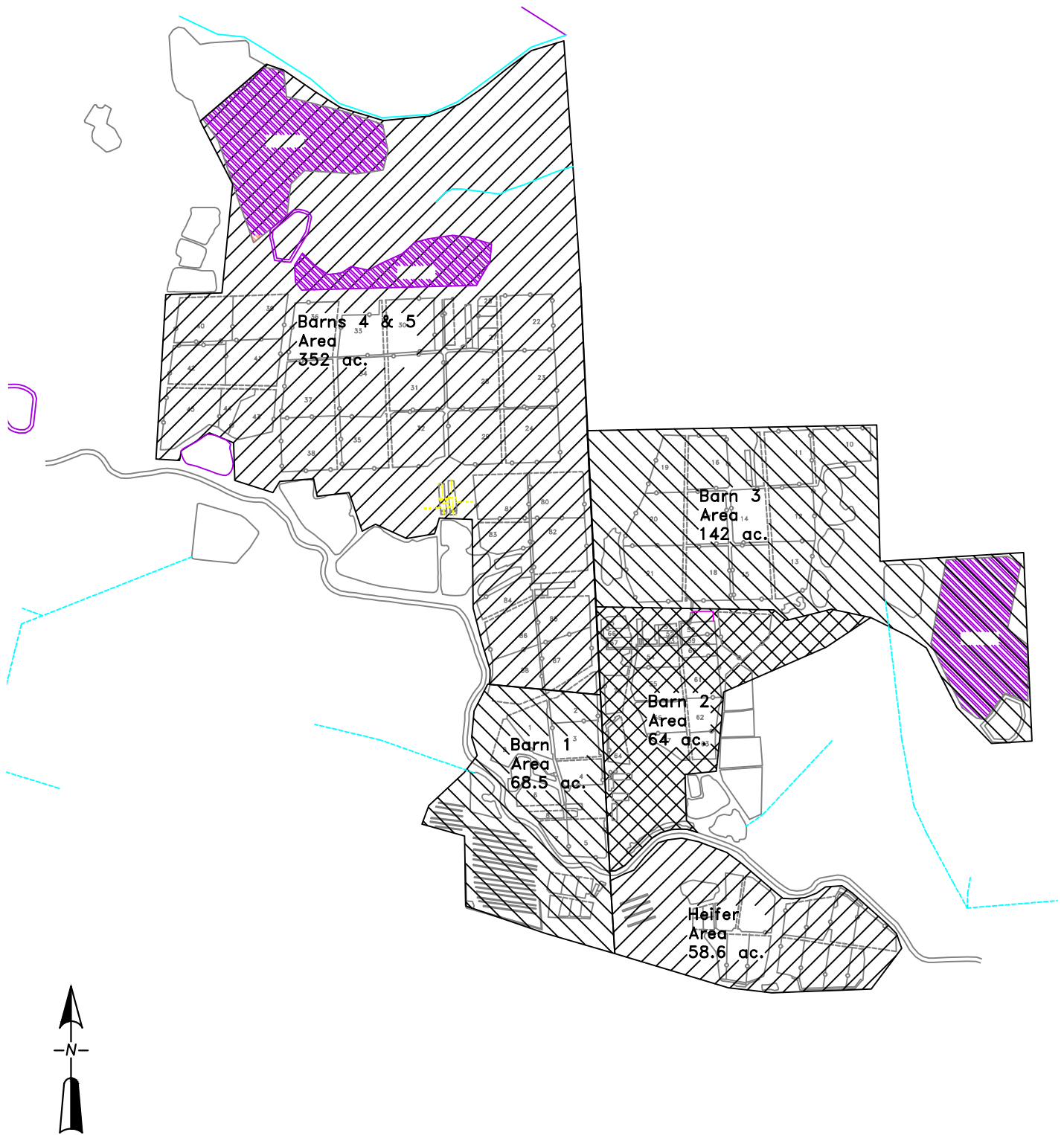
The Barn 1 area includes the corrals that drain to the barn 1 containment system and the calf raising and young heifer corrals on the west side of the access road. The dairy parlor and milking cow corrals are located on the east side of the canal. The parlor conveys process water into the Barn 1 Separator Pond. The corral runoff drains directly into Barn 1 Lagoon 1. Lagoon 1 overflows through a pipeline suspended over the canal into Barn 1 Lagoon 2. The calf area has a berm referred to as Calf Berm and a Southwest Pump Pit located on the southwest corner of the calf area. There is a pipeline connecting this pit to B1 Lagoon 2.

The contributing runoff area is mapped as 68.5 acres. The required storage volume for this area is 1.34 million cubic feet and the available storage is 1.62 million cubic feet. This area has adequate capacity to meet the 180-day storage requirement.

Heifer Area

The Heifer area includes the corrals on the south side of the canal and east of the access road into the dairy site. The corral runoff drains directly into Andys Pond 1. This pond is connected to Andys Pond 2 with a pipeline and water is conveyed to pond 2 on an as needed basis. Andys Pond 2 is connected to the Barn 2 Containment system with a pipeline that is suspended above the canal. There are some low spots in the corrals in the heifer area and these evaporate or are removed using a portable pump or tanker wagon and placed directly into either of the Andys Ponds.

The contributing runoff area is mapped as 598.6 acres. The required storage volume for this area is 0.60 million cubic feet and the available storage is 0.63 million cubic feet. This area has adequate capacity to meet the 180-day storage requirement.



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Runoff Areas

4 Brothers Dairy

SCALE: 1" = 1320'

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Page 24

Barn 3 Area

The Barn 3 area includes the corrals that drain to the barn 3 containment area and includes the composting area and containment immediately east of Barn 3. This area is comprised from the area south of the access road to Barn 3 and the area north of the access road to Barn 2. The corrals predominately drain south toward the Barn 2 access road and is collected in the Old flush lagoon. A portion of the site on the west side drains toward the west or southwest and is collected directly into the Pen 20 Pond. Pens on the East side of the site can drain directly into the Barn 3 lagoons 1, 2 or 3. The parlor conveys process water into the Barn 3 Pond 2. The water is separated using a mechanical screen and then is discharged into Barn 3 Ponds 1 or 3. The wastewater from these lagoons is then transferred to Barn 3 Pond 4 using a pump and portable pipe. The composting area east of Barn 3 drains runoff directly into the Barn 3 Compost Pond.

The contributing runoff area is mapped as 142 acres. The required storage volume for this area is 2.69 million cubic feet and the available storage is 2.65 million cubic feet. This area doesn't have adequate capacity on its own to meet the 180-day storage requirement. This area is located upgradient of the Barn 2 storage system. Excess production from this area flows to the Barn 2 system. The barn 2 system therefore must allow for roughly 0.034 million cubic feet of capacity.

Barn 2 Area

The Barn 2 area includes the corrals that drain to the barn 2 containment system and the feed storage and processing area on the east side of the facility access road. The dairy parlor and milking cow corrals are located on the north side of the canal. The parlor conveys process water into the Barn 2 Settling Cell. This cell then flows to Barn 2 Lagoon 1 and Lagoon 2. These lagoons are then manually transferred to the East Ponds 1,2,3 or 4 via portable pump and pipe. The corral runoff drains predominantly directly south into Barn 2 Settling Cell 1. The feed storage and processing area drains directly to the Commodity Collection Berm which overflows into Barn 2 Lagoon 1. The corrals on the northeast corner of this area can flow directly into the East Pond 4. The east ponds overflow from pond 4 to pond 3 to pond 2 to pond 1. Pond 1 being of lower elevation than the other ponds.

The contributing runoff area is mapped as 64 acres. The required storage volume for this area is 1.35 million cubic feet and the available storage is 2.45 million cubic feet. This yields a surplus of 1.1 million cubic feet. Including the Barn 3 excess process water of 0.034 million cubic feet yields a net excess of 1.06 million cubic feet of capacity. This area has adequate capacity to meet the 180-day storage requirement.

Barns 4 & 5 Area

The Barn 4 & 5 area includes the corrals that drain to the barn 4 and 5 containment system. This area includes the feed storage and composting located north of barn 4 and the corrals located south of barn 4 and around barn 5. All these areas are located on the west side of the facility access road and north of the canal. These two parlors have separate primary separator cells and then are combined for the longer-term storage of the process water from these two barns. The barn 4 parlor drains parlor water into the Barn 4 east or west separator cells. These cells overflow to the Barn 4 Pond 1. The barn 5 parlor drains parlor water into the Barn 5 north or south separator cells. These cells overflow to the Barn 4 Pond 1. Barn 4 Pond 1 then overflows to the Barn 4 Pond 2 which flows to Barn 4 Pond 3. Pond 3 is connected to Barn 4 Pond 4 via a suspended pipeline over the canal. Most of the corrals drain runoff directly to the south into Barn 4 ponds 1, 2 and 3. The west side of the corrals drain to the south into the Heifer Corral Runoff Pond. Water from Ponds 2 and 3 can be transferred via pipeline to the Pen 40 Ponds 1, 2 & 3. The Pen 40 ponds can then be transferred to the Pen 36 Lagoon, the Buckway Pond or Compost Runoff Pond using a portable pump and pipe. The feed storage and composting area north of Barn 4 drain in two directions. The south portion of this area drains to the southwest corner of the area on the south side of the Pen 36 Lagoon. This water is then transferred using portable pump into the Pen 36 lagoon. Excess runoff or if flow exceeds the pump capacity, the runoff will flow overland through the pens 39, 41 and 44 into the heifer corral runoff pond. The north portion of the composting area will drain runoff to the west into the Barn 4 Compost Runoff Pond. This pond is then transferred to the Pantone Pond using a portable pump and pipe. There is a diversion ditch on the north side of the composting area to prevent off site runoff from the north or east from entering the site.

The contributing runoff area is mapped as 352 acres. The required storage volume for this area is 6.27 million cubic feet and the available storage is 8.98 million cubic feet. This area has adequate capacity to meet the 180-day storage requirement.

Storage and Handling Plan Requirements

There are several wastewater containment structures currently located on the facility. Estimated dimensions for these structures are shown in the plan. It is estimated that together they will provide approximately 16,333,981 cubic feet of liquid storage. The AgTec sizings for these facilities show that 12,256,408 cubic feet of liquid storage will be needed to meet the 180-day storage requirement. If storage ponds are cleaned and properly managed, adequate wastewater storage should be available on the facility.

Storage Operations and Maintenance

The facility has 38 storage structures or ponds on the farm. Some of these structures date back over 30 years old. The facility has made considerable efforts to inspect and verify pond and liner integrity over the last few years. Most of the ponds have been cleaned out and evaluated by ISDA or by Engineering Consultants. There are a couple remaining ponds that will be evaluated as part of this permit period. The Barn 1 Separator Pond and Barn 1 Lagoon 1 still need evaluated.

Copies of the Engineering Evaluations and of ISDA Approvals are included in Appendix I. Not all the evaluations are included at this time. Some are unreadable from scanning and faxing etc. The other pond construction records will be added or updated as clean copies can be obtained from the original sources.

Manure Application Rates

This NMP has been developed using the Narrative Rate Approach. The farms planned or typical crop rotations are listed at the end of this plan and will typically be used. The order of crops grown may change from field to field and from year to year. Alternative crops may be grown, and the possible alternatives are shown in the crop rotation section of the plan.

Timing and method of nutrient application shall correspond as closely as possible with plant nutrient uptake timing, while considering cropping system limitations, weather and climatic conditions, risk analysis and field accessibility. Application methods to reduce the risk of nutrient transport to surface and ground water or into the atmosphere shall be employed.

Manure nutrient concentration is determined from manure testing. Manure testing was done on several manure streams applied on the farm in 2017. The following table shows the manure streams sampled and the concentration of nutrients within those streams.

Table A-3 - Manure Testing							N*1 Avail. Rate
Testing Liquids	N ppm	P ppm	K ppm	P2O5 ppm	K2O ppm	Moisture	
B1 Lagoon 2	234	699	5333	1601	6400	99.6%	40%
B2 Lagoon 2	272	1310	5916	3000	7099	99.6%	40%
B3 Pond 4	349	611	4833	1399	5800	99.4%	40%
B4 Pond 4	176	393	4583	900	5500	99.1%	40%
Testing Solids	N ppm	P ppm	K ppm	P2O5 ppm	K2O ppm	Moisture	
Open Lot corrals	10100	5808	19583	13300	23500	66.4%	30%
	0	0	0	0	0	0.0%	30%

*1 N Avail. Rate is the % of applied nitrogen expected to be available to the crop in the first year. Applications in successive years will increase manure N availability over time and should be accounted for.

Using the above concentrations, the following table A-4 was developed to show the amount of nutrients to be expected in various volumes and moisture contents of the waste streams to be land applied.

Table A-4 - Manure Testing Calculations				
B1 Lagoon 2 Calculations	Nutrients Applied Testing			Available*1
	N - lbs	P2O5 lbs	K2O lbs	N-lbs
1000 gallons	2.0	13.3	53.4	0.8
1/2 acre inch	26.5	181.3	724.6	10.6
1 acre inch	53.0	362.5	1449.3	21.2
Diluted to 10% acre inch	5.3	36.3	144.9	2.1
B2 Lagoon 2				
1000 gallons	2.3	25.0	59.2	0.9
1/2 acre inch	30.8	339.7	803.9	12.3
1 acre inch	61.6	679.4	1607.7	24.6
Diluted to 10% acre inch	6.2	67.9	160.8	2.5
B3 Pond 4				
1000 gallons	2.9	11.7	48.4	1.2
1/2 acre inch	39.5	158.4	656.7	15.8
1 acre inch	79.0	316.9	1313.4	31.6
Diluted to 10% acre inch	7.9	31.7	131.3	3.2
B4 Pond 4				
1000 gallons	1.5	7.5	45.9	0.6
1/2 acre inch	19.9	101.9	622.7	8.0
1 acre inch	39.9	203.8	1245.5	15.9
Diluted to 10% acre inch	4.0	20.4	124.5	1.6
Open Lot corrals Calculations	N - lbs	P2O5 lbs	K2O lbs	
Per ton @ 66.4% moisture	20.2	26.6	47.0	6.1
Per 10 Ton Load	202.0	266.0	470.0	60.6
Per 15 Ton Load	303.0	399.0	705.0	90.9
0 Calcs.	N - lbs	P2O5 lbs	K2O lbs	
Per ton @ 0% moisture	0.0	0.0	0.0	0.0
Per 10 ton load 65% moisture	0.0	0.0	0.0	0.0
Per 15 ton load 65% moisture	0.0	0.0	0.0	0.0

*1 Available N is the amount of nitrogen expected to be available to crop the year its applied

Based on the above table, a ton of solid manure at 65% moisture will provide 26.6 lbs of P2O5. Application rates will be determined based on individual field rotations and past manure applications. The above tables and rates are for explanatory purposes. **Current, within the last 9 months, manure samples must be utilized to determine actual application rates.**

Application rates for all fields will be determined by using the Idaho Phosphorous Site Index. The index will determine the allowable rates and this section outlines how manure sampling will be utilized to determine the volumes or rates of allowable manure application.

The following tables show the volumes of manure or lagoon water that can be applied based on the above testing to the proposed crops that will be predominately grown based on crop uptake application rates.

Table A-5a1 - B1 Lagoon 2 Application Rates							
		Crop P2O5 Uptake Rates					100%
Crop	N Avail	in/ acre	Total	lbs/acre			%N Uptake
	Rate		N - lbs	Avail. N	P2O5	K20	
Alfalfa	40%	0.2	12	5	85	339	1%
Corn silage	40%	0.4	21	9	145	581	4%
triticale	40%	0.4	20	8	140	560	2%
Barley	40%	0.1	5	2	36	145	2%
Pasture	40%	0.1	7	3	46	186	2%
Potatoes	40%	0.1	8	3	52	208	2%
wheat	40%	0.2	9	4	63	253	3%

Table A-5b - Open Lot corrals Application Rates							
		Crop P2O5 Uptake Rates					100%
Crop	N Avail	Tons/ acre	Total	lbs/acre			%N Uptake
	Rate		N - lbs	Avail. N	P2O5	K20	
Alfalfa	30%	3.2	64	19	85	150	5%
Corn silage	30%	5.5	110	33	145	257	15%
triticale	30%	5.3	106	32	140	248	7%
Barley	30%	1.4	28	8	36	64	8%
Pasture	30%	1.7	35	11	46	82	8%
Potatoes	30%	2.0	40	12	52	92	8%
wheat	30%	2.4	48	14	63	112	10%

Table A-5a3 - B2 Lagoon 2 Application Rates							
		Crop P2O5 Uptake Rates					100%
Crop	N Avail	in/ acre	Total	lbs/acre			%N Uptake
	Rate		N - lbs	Avail. N	P2O5	K20	
Alfalfa	40%	0.2	14	6	159	377	1%
Corn silage	40%	0.4	25	10	273	645	5%
triticale	40%	0.4	24	10	263	622	2%
Barley	40%	0.1	6	2	68	161	2%
Pasture	40%	0.1	8	3	87	206	2%
Potatoes	40%	0.1	9	4	98	231	2%
wheat	40%	0.2	11	4	119	281	3%

Table A-5a4 - B3 Pond 4 Application Rates							
Crop P2O5 Uptake Rates							100%
Crop	N Avail	in/ acre	Total N - lbs	lbs/acre			%N Uptake
	Rate			Avail. N	P2O5	K2O	
Alfalfa	40%	0.3	21	8	85	352	2%
Corn silage	40%	0.5	36	15	94	572	7%
triticale	40%	0.4	35	14	90	551	3%
Barley	40%	0.1	9	4	23	143	3%
Pasture	40%	0.1	12	5	30	182	3%
Potatoes	40%	0.2	13	5	33	205	4%
wheat	40%	0.2	16	6	41	249	4%

Table A-5a5 - B4 Pond 4 Application Rates							
Crop P2O5 Uptake Rates							100%
Crop	N Avail	in/ acre	Total N - lbs	lbs/acre			%N Uptake
	Rate			Avail. N	P2O5	K2O	
Alfalfa	40%	0.4	17	7	85	519	2%
Corn silage	40%	0.7	28	11	145	889	5%
triticale	40%	0.7	27	11	140	856	2%
Barley	40%	0.2	7	3	36	222	3%
Pasture	40%	0.2	9	4	46	284	3%
Potatoes	40%	0.3	10	4	52	318	3%
wheat	40%	0.3	12	5	63	387	3%

The tables above show the amount of manure that can be applied to cropped fields to match crop phosphorous uptake levels based on manure testing. Lagoon applications should closely match those rates for yearly crop uptake. Based on the table above a corn crop will utilize 5.5 tons of manure a year at the crop uptake rate of P2O5. Since it is difficult to apply at this level a higher rate can be used to apply 2 or more years of phosphorous to a field to reduce the frequency of application to a field and the impacts of vehicle traffic and compaction to the soils. This can only be done if the Phosphorous Index would allow the higher rate. One item of note is that this solid sample was from open lot manure and not compost. Currently the facility is predominately converting all the open lot corral manure to compost for export or application. It is recommended to sample compost that is finished before land application to best determine the nutrient content of the compost.

Manure Sampling and Laboratory Analyses (Testing).

Nutrient values of manure, organic by-products and biosolids must be determined prior to land application. Manure analyses must include, at minimum,

total nitrogen (N), ammonium N, total phosphorus (P) or P2O5, total potassium (K) or K2O, and percent solids, or follow UI guidance regarding required analyses.

Manure, organic by-products, and biosolids samples must be collected and analyzed at least annually, or more frequently if needed to account for operational changes (feed

management, animal type, manure handling strategy, etc.) impacting manure nutrient concentrations.

Samples must be collected, prepared, stored, and shipped, following UI (CIS 1139) guidance or industry practice.

Manure testing analyses must be performed by laboratories successfully meeting the requirements and performance standards of the Manure Testing Laboratory Certification program (MTLCP) under the -CPS-6 NRCS, ID 590 January 2013 auspices of the Minnesota Department of Agriculture, or other NRCS- approved program that considers laboratory performance and proficiency to assure accurate manure test results.

Cropping Plan

There is approximately 3226 acres of farm ground owned or operated by Four Brothers Dairy. The dairy maintains a diverse crop rotation in conjunction with trading farm ground with neighboring farmers.

Liquid waste is currently plumbed to the Silva Fields pivots. The Kelly, East and east swing pivots also receive liquid waste. The Sandy North and Sandy South are planned to be incorporated into the liquid waste system this NMP cycle. The Hubbs pivot is also considered to be added if needed this cycle. The facility sold and traded a few fields and added some new ground immediately north of the dairy. The ground was surface irrigated pastures mostly and pivot irrigation will be added over time to develop this ground. These are the Buckway East, the barn3 pivots and the 150 West Pivot.

The following table A-C1 shows the crops that have been and are expected to be grown on the farm over the next permit cycle.

Table A-C1 - Typical Crops Grown on the Farm and Nutrient Composition

Crop	Yield	Yield wt	Dry portion	Dry yield lbs/ac	% composition			Uptake lbs/acre		
					N	P	K	N	P2O5	K2O
Alfalfa	7	2000	90.4%	12656	3.35%	0.29%	2.72%	424.0	84.9	412.8
Corn silage	30	2000	30.0%	18000	1.30%	0.38%	1.04%	233.1	155.8	223.8
triticale	9	2000	30.0%	5100	2.45%	0.34%	0.57%	125.0	39.7	34.9
Barley	135	48	87.3%	5657	2.32%	0.35%	0.49%	131.2	45.3	33.3
Pasture	5	2000	89.0%	8010	1.71%	0.25%	2.79%	137.0	46.4	268.2
Beets	30	2000	20.7%	12432	0.11%	0.22%	1.54%	13.1	61.9	230.2
wheat	120	60	88.3%	6358	2.30%	0.44%	0.49%	146.2	63.3	37.2
Potatoes	400	100	23.0%	9200	1.61%	0.25%	2.00%	148.1	52.0	220.5

Land Application Site Assessment

All farm fields will be assessed each year using the Idaho Phosphorous Site Index (PSI). The PSI is an active index where the index rating changes based on cropping, soil test results, application rates and application methods. As these will change from crop to crop and season to season the index will be run or developed at the beginning of the spring season after soils sample results are obtained and manure analysis has been performed. A copy of the current risk assessment and a copy of the protocol is included in Appendix A.

This first run of the index utilized 2020 soil sampling results. No bmp credits were applied as this year cropping system is still being finalized. The index shows that there are several fields that are limited to ½ crop uptake application rates and most others are limited to crop uptake rates. The dairy has made a serious effort to reduce soil phosphorous levels in high fields and has exported nearly all its manure for the past two seasons to bring levels down.

There are several bmps that could be applied that would change the index rating. There are several fields that have berming to prevent surface runoff from leaving the fields. In order to receive credit for this bmp the berming will need to be evaluated to see if it meets either of the bmp criteria. The planner and producer will work together to determine what bmps should or could be implemented on each field to meet facility objectives.

Any bmp credits will be documented in the plan as part of the facility record keeping.

Soil Sampling Protocol

Soil samples must be taken from every field to which manure, litter and process wastewater will be applied. Soil must be analyzed annually in accordance with University of Idaho Bulletin 704 (Appendix D). At a minimum, soil samples must be analyzed for the following constituents: pH, soil organic matter (SOM), Nitrate-Nitrogen (NO₃-N), Ammonium-Nitrate (NH₄-N), and phosphorus (P). The results of these analyses must be included in the NMP and used in determining application rates for manure, litter, and process wastewater as described in Section III.A.2.h.

Soil samples must be analyzed by a laboratory certified by the North American Proficiency Testing Program (NAPT).

Annual Nutrient Budgeting

Annual nutrient budgets must be generated to determine land application rates for each field where manure, litter, or process wastewater is applied. The annual budget must be included in the NMP and be developed in accordance with the University of Idaho Fertilizer Guides or related University of Idaho Crop Production Guide. In the absence of an appropriate University of Idaho Fertilizer or Crop Production Guide, a fertilizer or production guide from a Pacific Northwest Land Grant University may be used (i.e. Oregon State University or Washington State University). In the absence of specific Land Grant University fertilizer or production guides, the NMP must identify and include the best available data used to determine specific land application rates for the crop. The NMP must express land application rates of nutrients in pounds per acre; and volume of manure, litter, and process wastewater in tons, gallons or cubic feet. Ensuring accurate application rates reduces probability of off-site transport. The NMP developed to meet the requirements of this permit, and submitted to the permitting authority for review, must include all necessary calculations. Thereafter, for the remainder of the permit term, application rates may be calculated annually, or immediately prior to land application, if all data and calculations are appropriately documented in the NMP.

The PSI shall be the protocol used to develop nutrient budgets within this NMP.

Third Party Export

Any excess manure generated by the facility will be exported to third party receivers. The following table is a list of the current third party receivers for the farm.

Table TP – Third Party Receivers

Name	Address	Phone Number	Acres Available for Manure Application
Fred Stechlin	141 W 620 N, Shoshone, ID, 83352	(b) (6)	156
Gary Jerome	874 4 Mile Rd, Shoshone, ID, 83352		110
Craig Hansen	212 E 620 N, Shoshone, ID, 83352		100
Silent T Ranch	420 N 700 W, Shoshone, ID, 83352	2088862793	200
Ted Lennon	770 N 150 W, Shoshone, ID, 83352	(b) (6)	350

V&C Ranch LLC	455 4 Mile Rd,Shoshone,ID,83352	2088867914	90
Carl Pendelton	50 W 620 N,Shoshone,ID,83352	(b) (6)	525
Alex Bilbao	893 4 Mile Rd,Shoshone,ID,83352	(b) (6)	550
Paul Jerome	34 E 420 N,Shoshone,ID,83352		160
Paul Sluder	796 W 520 N,Shoshone,ID,83352		80
Desert's Edge Angus	558 N 200 W,Shoshone,ID,83352	2088867564	640
Eden Farms	414 N 800 W,Gooding,ID,83330	2088862180	900
Sabala Farms	1819 E 1550 S,Gooding,ID,83330	2089344360	930
Craig Olsen	215 Montana St,Gooding,ID,83330	(b) (6)	350
Tunapa Ranch	2490 E 1700 S,Gooding,ID,83330	2088869259	407
Big Wood Farms	P.O Box 741,Shoshone,ID,83352	2088862777	1000
Glen Davis	800 W 720 N,Shoshone,ID,83352	(b) (6)	80
Randy Lowry	521 N 650 W,Shoshone,ID,83352	(b) (6)	30
Braun Farms	2359 E 1375 S,Gooding,ID,83330	2089348450	200
Chris Arratte	106 E 420 N,Shoshone,ID,83352	(b) (6)	560
Steve & Wendy Mohr	503 W 470 N,Shoshone,ID,83352	(b) (6)	60
Brent Williams	583 W 720 N,Shoshone,ID,83352		240
Bill Murphy	620 N 488 W,Shoshone,ID,83352		120
The Windy H	762 W 620 N,Shoshone,ID,83352	2083581711	130
Hi Line Farms Inc.	548 N 680 W,Shoshone,ID,83352	2088862072	350
Magic Valley Compost	76 N 400 W,Jerome,ID,83338	2083244536	6311
Craig Hadden	300 E 600		600

	N,Shoshone,ID,83352		
Glanbia Richfield	,Richfield,ID,		600
Dean Techannen	,Shoshone,ID,83352		200
Bryan Barney	284 West 420 N,Shoshone,ID,83352		20
Larry Barney	750 W 738 N,Shoshone,ID,83352	(b) (6)	153

As shown in the table above the facility has identified 16,200 acres of third party ground to accept manure nutrients from the facility.

Requirements for the Transfer of Manure, Litter, and Process Wastewater

1. In cases where CAFO-generated manure, litter, or process wastewater is sold or given away, the permittee must comply with the following conditions:
 - a. Maintain records showing the date and amount of manure, litter, and/or process wastewater that leaves the permitted facility;
 - b. Record the name and address of the recipient;
 - c. Provide the recipient(s) with representative information on the nutrient content of the manure, litter, and/or process wastewater analyzed in accordance with Section III.A.2.g.i; and
 - d. Retain the records on-site, for a period of five years, and submit the records to EPA, upon request.

Mortality Management

Dead animal management on livestock facilities is regulated by ISDA. The rules governing Dead Animal Movement and Disposal, IDAPA 02.04.17, outline the acceptable practices for the movement and disposal of dead animals. Violations of these rules constitute a misdemeanor and violators can be fined up to \$5,000 for each offense. Dead animals are required to be disposed of within 72 hours of knowledge of death. This facility will utilize two accepted dead animal disposal practices. Rendering pick-up and landfill are the practices to be utilized by the facility.

Rendering pick-up is the preferred method of dead animal disposal for this facility. Rendering service is currently available and is normally reliable for CAFO facilities. Rendering service normally pick-up dead animals daily. However, there may be times when normal pick-up cannot

be done. For example, rendering service is not typically available on the weekends or holidays, and could allow 72 hours to pass without reliable rendering pick-up. At these times, other methods of dead animal disposal will be necessary. Direct hauling to the Burley Landfill is the alternate method of accepted dead animal disposal that will be used by the facility.

As mortalities are identified each day, the operator moves the carcasses to the pickup location located southeast of the Barn3Pond4. This area is far from public view and is far from any surface water resources. No additional management practices are needed to protect waters of the US at this location. The rendering pickup will pick up at this location. Any carcass not picked up after 48 hours is loaded into a dump truck or dump bed trailer and hauled by the operator or his agent to the Burley Landfill.

In the event of a catastrophic loss of cattle, the facility will immediately contact the ISDA for disposal guidance. ISDA will likely have an action plan as any catastrophic loss would typically involve multiple facilities. If ISDA isn't responsive or not immediately available then the facility will haul mortalities to the Burley Land Fill.

Chemical Handling & Management

Ensure that chemicals and other contaminants handled on-site are not disposed of in any manure, litter, process wastewater, or stormwater storage or treatment system unless specifically designed to treat such chemicals or contaminants. All wastes from dipping vats, pest and parasite control units, and other facilities used for managing potentially hazardous or toxic chemicals must be handled and disposed of in a manner sufficient to prevent pollutants from entering the manure, litter, or process wastewater retention structures or waters of the U.S.

Workers should be protected from and avoid unnecessary contact with chemical fertilizers and organic byproducts. Protection should include the use of protective clothing when working with plant nutrients.

Extra caution must be taken when handling ammonia sources of nutrients, or when dealing with organic wastes stored in unventilated enclosures. If the history of composting is not complete, then take extra caution in handling these materials since they could be a source of E-coli and intrinsic viruses and other disease vectors.

Protect fertilizer and organic by-product storage facilities from weather and accidental leakage or spillage. Storage of manure, fertilizers and cleaning of application equipment should be done away from a wellhead.

Calibrate application equipment to ensure uniform distribution of material at planned rates.

The disposal of material generated from cleaning nutrient application equipment should be stored and disposed of properly. Excess material should be collected and stored, or field applied in an appropriate manner. Excess material should not be applied on areas of high potential risk for runoff and leaching.

The disposal or recycling of nutrient containers should be done according to state and local guidelines or regulations.

Safety must be a primary consideration in managing animal waste. It must be considered during planning, siting, and designing of agricultural waste management system (AWMS) components, as well as during the actual operation of handling wastes. The operator must be made aware of safety aspects of any waste management system and the AWMS components under consideration. The potential for an accident with waste management components is always present.

Odors and nuisance flies can be a problem with storage and management of animal wastes. The operator must be made aware that enlarging the surface area of the waste management system also increases the potential for generation of greater risk to odors and nuisance flies.

A variety of gases can be generated in the operation of an AWMS that can cause asphyxiation, poisoning, and explosions. Manure gases can accumulate when manure is stored in environments that do not have adequate ventilation, such as underground covered waste storage tanks. Waste storage facilities and lagoons placed in open environments also store and release gases, especially during agitation. These gases can reach toxic concentrations and displace oxygen. The four main gases are ammonia (NH₃), carbon dioxide (CO₂), hydrogen sulfide (H₂S), and methane (CH₄).

RECORDS, REPORTING, MONITORING, AND NOTIFICATION

A. Records Management

1. Record Keeping Requirements for the Production Area

The permittee must maintain on-site for a period of five (5) years from the date they are created a complete copy of the NOI, the NMP, records to document the implementation and management of Section II.A and Section III.A.2.a-e, Section

and Section IV.A.1.a-i below. The permittee must make these records available to EPA upon request.

- a. Records documenting the inspections of all storage, containment and treatment structures as required under Section II.A.2.a and Section III.A.2.a;
- b. Weekly records of the depth of the manure and process wastewater in storage, containment and/or treatment structure(s), as applicable, as indicated by the depth marker under Section II.A.2.b;
- c. Documentation of whether the wastewater level in all liquid waste storage structures is below the level required to maintain capacity to store the runoff and precipitation from a 25-year, 24-hour storm under Section II.A.2.b;
- d. Records documenting the inspections of all stormwater diversion and channel structures under Section III.A.2.c;
- e. Records documenting the inspections of all water line inspections, including drinking and cooling water lines and whether leaks were discovered;
- f. For all structures in Section II.A.2.a.i-iii, records documenting any actions taken to correct deficiencies required under Section II.A.2.c. Deficiencies not corrected with thirty (30) days must be accompanied by an explanation of the factors preventing immediate correction;
- g. Records of mortalities management and practices used by the permittee to meet the requirements of Section II.A.2.d and Section III.A.2.b;
- h. Records documenting the current design of any wastewater or manure storage structure to meet the requirements of Section II.A.1.b. including volume for solids accumulation, design treatment volume, total design volume, and approximate number of days of storage capacity; and
- i. Records of the date, time, and estimated volume of any overflow and additional requirements of Section IV.D.

2. Record Keeping Requirements for the Land Application Area

Each permittee must maintain on-site for a period of five (5) years from the date they are created, a complete copy of the information required by Section II.B and Section III.A.2.f-i, and the records specified in Section IV.A.2.a-f below. The permittee must make these records available to EPA upon request. For every field, provide the following information associated with the same unique field identification used in the NMP:

- a. The date(s) manure, litter, or process waste water application was begun for each field, for each land application event and all methods associated with the application of the manure, litter or process wastewater, including application method, incorporation method, soil surface conditions, weather conditions, number of acres utilized, amounts of manure, litter and process wastewater, and total amounts of nitrogen and phosphorus applied under Sections II.B.2, 3 and 5 and Section III.A.2.h;
- b. Documentation of all manure, litter or process wastewater sample collection and analysis protocols under Section II.B.6 and Section III.A.2.g.i;
- c. Documentation of all soil sample collection and analysis protocols under Section II.B.6 and Section III.A.2.g.ii;
- d. Documentation that all required setbacks, buffers or approved alternatives and conservation practices identified in the NMP were observed and/or implemented, and an explanation for any deviation from these practices under Section II.B.4 and Section II.B.8;
- e. The date that the equipment used for the land application event was last inspected under Section II.B.7; and
- f. Documentation for all requirements for manure, litter and process wastewater transfers under Section III.D.

Appendix A – Phosphorous Risk Index

Phosphorous Risk Index Analysis

Phosphorous Risk Index Protocol

AgTec Phosphorous Risk Index Assessment

Date: 3/10/2021

Facility: Four Brothers

Address: 425 N 250 W Shoshone, ID

Assessment Year

2021 Fall 2020 Soil test

Field ID	East	East 1/2 Sw	Hubbs	Race	Rienstra
Acres	90	23.3	47.52	139	103
Soil Test P	169	169	163	93	84
P Index Scoring	188	188	171	121	90

AgTec Management Options

No application	118	118	106	65	46
Lagoon App 60-150 lbs P2O5	202	202	184	149	112
Solids >300 lbs, <7 day incorp.	258	258	236	205	156
Solids >300 lbs, >7 day incorp.	286	286	262	233	178

Part A Soil Erodibility	2	2	1	2	1
Soil Runoff Surface Irrigated	0	0	0	0	0
Soil Runoff Sprinkler or non	2	2	2	2	0
Leaching Potential	2	2	2	2	2
Distance to Surface Water	8	8	8	8	8
Sum of Part A	14	14	13	14	11
BMP Credits	0	0	0	0	0
Part B Soil Score	8.45	8.45	8.15	4.65	4.2
P app rate lbs/ac	1	1	1	2	2
Phos app method	4	4	4	2	2
Sum of Part B	13.45	13.45	13.15	8.65	8.2

Raw Data

P App Rate lbs P2O5/ac.	<60	<60	<60	60-150	60-150
P App Method	Incorp >7 days or no incorporation when applied between February 16 and December 15	Incorp >7 days or no incorporation when applied between February 16 and December 15	Incorp >7 days or no incorporation when applied between February 16 and December 15	Incorp w/in 7 days of application	Incorp w/in 7 days of application
BMP 1	None	None	None	None	None
BMP 2	None	None	None	None	None
Soil Slope	0.029	0.03	0.025	0.024	0.013
Kw Value	0.49	0.49	0.43	0.49	0.43
Hydrologic Soil Group	C	C	C	C	C
Ksat (in/hr)	1.28	1.28	1.28	1.28	1.28
HWT (<24")	>60	>60	>60	>60	>60
Depth to Bedrock(in.)	31	31	>60	31	>60
Distance to Surface Water (ft)	147	25	130	106	10

P Index Scoring Ratings

Low	Medium	High	Very High
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AgTec Phosphorous

Facility: Four Brothers

Assessment Year

Field ID	Silva	150 West	B3P1	B3P5	BuckE
Acres	131	77	142	11.6	110
Soil Test P	46	24	24	24	26
P Index Scoring	91	57	58	74	74

AgTec Management Option

No application	25	13	10	10	10
Lagoon App 60-150 lbs P2O5	91	79	58	58	58
Solids >300 lbs, <7 day incorp.	135	123	90	90	90
Solids >300 lbs, >7 day incorp.	157	145	106	106	106

Part A	Soil Erodibility	1	1	0	0	1
	Soil Runoff Surface Irrigated	0	0	0	0	0
	Soil Runoff Sprinkler or non	0	0	2	2	1
	Leaching Potential	2	2	4	4	4
	Distance to Surface Water	8	8	2	2	2
	Sum of Part A	11	11	8	8	8
	BMP Credits	0	0	0	0	0
Part B	Soil Score	2.3	1.2	1.2	1.2	1.3
	P app rate lbs/ac	2	2	2	4	4
	Phos app method	4	2	4	4	4
	Sum of Part B	8.3	5.2	7.2	9.2	9.3

Raw Data

P App Rate lbs P2O5/ac.	60-150	60-150	60-150	151-300	151-300
P App Method	Incorp >7 days or no incorporation when applied between February 16 and December 15	Incorp w/in 7 days of application	Incorp >7 days or no incorporation when applied between February 16 and December 15	Incorp >7 days or no incorporation when applied between February 16 and December 15	Incorp >7 days or no incorporation when applied between February 16 and December 15
BMP 1	None	None	None	None	None
BMP 2	None	None	None	None	None
Soil Slope	0.017	0.014	0.028	0.021	0.018
Kw Value	0.49	0.49	0.17	0.17	0.49
Hydrologic Soil Group	C	C	D,A/D,B/D,C/D	D,A/D,B/D,C/D	D,A/D,B/D,C/D
Ksat (in/hr)	1.28	1.28	1.28	1.28	1.28
HWT (<24")	>60	>60	>60	>60	>60
Depth to Bedrock(in.)	31	31	26	26	31
Distance to Surface Water (ft)	30	10	200	800	350

P Index Scoring Ratings

Low	Medium	High	Very High
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AgTec Phosphorous

Facility: Four Brothers

Assessment Year

Field ID	BuckW	Pantone	Gardner	Kelly	Sandy N
Acres	84	79	92	103	120
Soil Test P	73	0	0	34	178
P Index Scoring	97	56	56	68	149

AgTec Management Option

No application	37	0	0	12	89
Lagoon App 60-150 lbs P2O5	97	84	84	54	149
Solids >300 lbs, <7 day incorp.	137	140	140	82	189
Solids >300 lbs, >7 day incorp.	157	168	168	96	209

Part A	Soil Erodibility	2	1	0	1	2
	Soil Runoff Surface Irrigated	0	0	0	0	0
	Soil Runoff Sprinkler or non	2	1	2	2	2
	Leaching Potential	4	4	4	2	4
	Distance to Surface Water	2	8	8	2	2
	Sum of Part A	10	14	14	7	10
	BMP Credits	0	0	0	0	0
Part B	Soil Score	3.65	0	0	1.7	8.9
	P app rate lbs/ac	2	2	2	4	2
	Phos app method	4	2	2	4	4
	Sum of Part B	9.65	4	4	9.7	14.9

Raw Data

P App Rate lbs P2O5/ac.	60-150	60-150	60-150	151-300	60-150
P App Method	Incorp >7 days or no incorporation when applied between February 16 and December 15	Incorp w/in 7 days of application	Incorp w/in 7 days of application	Incorp >7 days or no incorporation when applied between February 16 and December 15	Incorp >7 days or no incorporation when applied between February 16 and December 15
BMP 1	None	None	None	None	None
BMP 2	None	None	None	None	None
Soil Slope	0.024	0.017	0.028	0.025	0.022
Kw Value	0.49	0.43	0.17	0.43	0.49
Hydrologic Soil Group	D,A/D,B/D,C/D	D,A/D,B/D,C/D	D,A/D,B/D,C/D	C	D,A/D,B/D,C/D
Ksat (in/hr)	1.28	0.40	1.28	1.28	1.28
HWT (<24")	>60	>60	>60	>60	>60
Depth to Bedrock(in.)	31	59	26	>60	31
Distance to Surface Water (ft)	1100	10	20	1580	1760

P Index Scoring Ratings

Low	Medium	High	Very High
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AgTec Phosphorous

Facility: Four Brothers

Assessment Year

Field ID	Sandy S	Grange	Sherman	Hall	Saint
Acres	69	30	51	84	91
Soil Test P	134	84	0	112	0
P Index Scoring	152	82	42	134	66

AgTec Management Option

No application	87	42	0	78	0
Lagoon App 60-150 lbs P2O5	165	102	42	162	66
Solids >300 lbs, <7 day incorp.	217	142	70	218	110
Solids >300 lbs, >7 day incorp.	243	162	84	246	132

Part A Soil Erodibility	1	2	1	0	1
Soil Runoff Surface Irrigated	0	0	0	0	0
Soil Runoff Sprinkler or non	0	2	2	2	0
Leaching Potential	4	4	2	4	2
Distance to Surface Water	8	2	2	8	8
Sum of Part A	13	10	7	14	11
BMP Credits	0	0	0	0	0
Part B Soil Score	6.7	4.2	0	5.6	0
P app rate lbs/ac	1	2	4	2	4
Phos app method	4	2	2	2	2
Sum of Part B	11.7	8.2	6	9.6	6

Raw Data

P App Rate lbs P2O5/ac.	<60	60-150	151-300	60-150	151-300
P App Method	Incorp >7 days or no incorporation when applied between February 16 and December 15	Incorp w/in 7 days of application	Incorp w/in 7 days of application	Incorp w/in 7 days of application	Incorp w/in 7 days of application
BMP 1	None	None	None	None	None
BMP 2	None	None	None	None	None
Soil Slope	0.019	0.024	0.025	0.027	0.017
Kw Value	0.37	0.49	0.43	0.17	0.49
Hydrologic Soil Group	B	D,A/D,B/D,C/D	C	D,A/D,B/D,C/D	C
Ksat (in/hr)	3.26	1.28	1.28	1.28	1.28
HWT (<24")	>60	>60	>60	>60	>60
Depth to Bedrock(in.)	>60	31	>60	26	31
Distance to Surface Water (ft)	190	640	290	20	5

P Index Scoring Ratings

Low	Medium	High	Very High
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AgTec Phosphorous

Facility: Four Brothers

Assessment Year

Field ID	Heitman	Villa	Jones	Adams	North
Acres	62	60	126	148	271
Soil Test P	97	73	186	142	133
P Index Scoring	71	107	185	141	139

AgTec Management Option

No application	39	51	140	99	73
Lagoon App 60-150 lbs P2O5	87	135	230	183	139
Solids >300 lbs, <7 day incorp.	119	191	290	239	183
Solids >300 lbs, >7 day incorp.	135	219	320	267	205

Part A	Soil Erodibility	1	1	1	1	1
	Soil Runoff Surface Irrigated	0	0	0	0	0
	Soil Runoff Sprinkler or non	1	1	2	1	0
	Leaching Potential	4	4	4	4	2
	Distance to Surface Water	2	8	8	8	8
	Sum of Part A	8	14	15	14	11
	BMP Credits	0	0	0	0	0
Part B	Soil Score	4.85	3.65	9.3	7.1	6.65
	P app rate lbs/ac	2	2	1	1	4
	Phos app method	2	2	2	2	2
	Sum of Part B	8.85	7.65	12.3	10.1	12.65

Raw Data

P App Rate lbs P2O5/ac.	60-150	60-150	<60	<60	151-300
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P App Method

Incorp w/in 7 days of application Incorp w/in 7 days of application Incorp w/in 7 days of application Incorp w/in 7 days of application Incorp w/in 7 days of application

BMP 1	None	None	None	None	None
BMP 2	None	None	None	None	None
Soil Slope	0.014	0.009	0.027	0.016	0.0011
Kw Value	0.43	0.49	0.43	0.43	0.49
Hydrologic Soil Group	D,A/D,B/D,C/D	D,A/D,B/D,C/D	D,A/D,B/D,C/D	D,A/D,B/D,C/D	C
Ksat (in/hr)	0.40	1.28	0.40	0.40	1.28
HWT (<24")	>60	>60	>60	>60	>60
Depth to Bedrock(in.)	59	31	59	59	31
Distance to Surface Water (ft)	315	10	12	10	25

P Index Scoring Ratings

Low	Medium	High	Very High
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AgTec Phosphorous

Facility: Four Brothers

Assessment Year

Field ID	German	Low Farm	Dietrich
Acres	202	463	217
Soil Test P	168	78	98
P Index Scoring	99	69	22

AgTec Management Option

No application	67	27	10
Lagoon App 60-150 lbs P2O5	115	69	22
Solids >300 lbs, <7 day incorp.	147	97	30
Solids >300 lbs, >7 day incorp.	163	111	34

Part A	Soil Erodibility	1	1	0
	Soil Runoff Surface Irrigated	0	0	0
	Soil Runoff Sprinkler or non	1	0	0
	Leaching Potential	4	4	2
	Distance to Surface Water	2	2	0
	Sum of Part A	8	7	2
	BMP Credits	0	0	0
Part B	Soil Score	8.4	3.9	4.9
	P app rate lbs/ac	2	4	4
	Phos app method	2	2	2
	Sum of Part B	12.4	9.9	10.9

Raw Data

P App Rate lbs P2O5/ac.	60-150	151-300	151-300
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P App Method

Incorp w/in 7 days of application Incorp w/in 7 days of application Incorp w/in 7 days of application

BMP 1	None	None	None
BMP 2	None	None	None
Soil Slope	0.0117	0.02	0.006
Kw Value	0.43	0.37	0.32
Hydrologic Soil Group	D,A/D,B/D,C/D	B	C
Ksat (in/hr)	0.40	3.26	1.28
HWT (<24")	>60	>60	>60
Depth to Bedrock(in.)	59	>60	28
Distance to Surface Water (ft)	2300	1200	>2640

P Index Scoring Ratings

Low	Medium	High
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P Index Scoring -

<75	LOW potential for P movement from this site given current management practices and site characteristics. There is a low probability of an adverse impact to surface waters from P losses from this site. Nitrogen-based nutrient management planning is satisfactory for this site. Soil P levels and P loss potential may increase in the future due to N-based nutrient management planning.
75-150	MEDIUM potential for P movement from this site given current management practices and site characteristics. Phosphorous applications shall be limited to the amount expected to be removed from the field by crop harvest or soil test-based P application recommendations. Testing of manure P prior to application is required.
151-225	HIGH potential for P movement from this site given the current management practices and site characteristics. Phosphorus applications shall be limited to 50% of crop P uptake. Testing of manure P prior to application is required.
>225	VERY HIGH potential for P movement from this site given current management practices and site characteristics. No P shall be applied to this site.
This assessment and planning tool was created by AgTec from the 2017 version of The Phosphorus Site Index by Dr. April Leytem, USDA ARS. While the scoring is public knowledge the use of that information and the planning and presentation of that information within this sheet is private and not for public use and the sole property of Matthew W Thompson P.E.	

The Phosphorus Site Index:
A Systematic Approach to Assess the Risk of Nonpoint Source Pollution of Idaho Waters by
Agricultural Phosphorus

Dr. April Leytem
Research Soil Scientist
USDA- ARS

Dr. David Bjorneberg
Supervisory Agricultural Engineer
USDA-ARS

Dr. David Tarkalson
Research System Agronomist
USDA-ARS

2017

Table of Contents

Introduction	4
Why is phosphorus a concern for Idaho	4
What is a phosphorus site index	5
Phosphorus Site Index:	7
Part A: Phosphorus Loss Potential Due to Site and Transport Characteristics	8
Part B: Phosphorus Loss Potential Due to P Source and Management Practices	8
Usage of the Idaho Phosphorus Site Index	11
Phosphorus Site Index – Part A:	12
Soil Erosion	13
Runoff Index	15
Leaching Potential	16
Distance from Edge of Field to Surface Water	17
Best Management Practices for Reducing Transport Losses of P	18
Phosphorus Site Index Part A – Sample Calculation	21
Phosphorus Site Index – Part B:	22
Soil Test Phosphorus	23
Phosphorus Application Rate	24
Phosphorus Application Method	25
Phosphorus Site Index Part B – Sample Calculation	27
Calculation and Interpretation of the Overall P Loss Rating for a Site	28
Interpretation of the P Site Index Value	29
Best Management Practice Definitions	30
References	32

List of Tables

Table 1. The Phosphorus Site Index Proposed for use in Idaho	9
Table 2. Generalized Interpretation of the P Site Index Value	10
Table 3. Soil erodibility factor	14
Table 4. Runoff index for surface irrigated fields	15
Table 5. Runoff index for sprinkler or non-irrigated fields	15
Table 6. Leaching potential	16
Table 7. Distance from edge of field to surface water	17
Table 8. Management practices to reduce the loss of P from fields	19
Table 9. Phosphorus application rate	24
Table 10. Phosphorus concentration of dairy manure	24
Table 11. Values for P application methods for the P Site Index	25
Table 12. Generalized Interpretation of the P Site Index Value	29

INTRODUCTION

Why is phosphorus a concern for Idaho?

Water quality in Idaho has been negatively impacted by the inputs of nutrients from both point and nonpoint sources. The two nutrients of greatest concern are nitrogen (N) and phosphorus (P). Efforts to reduce nutrient enrichment of ground and surface waters have become a high priority for state and federal agencies and a matter of considerable importance to all nutrient users and nutrient generators in the state. Two actions in particular highlight the importance of this issue in Idaho:

- Total Maximum Daily Load (TMDL) Program: Section 303(d) of the Federal Clean Water Act (CWA) of 1972 requires states to develop a list of water bodies that need pollution reduction beyond that achievable with existing control measures. These water bodies are referred to as “Water Quality Limited” and are compiled by each state on a “303(d) list”. States are required to develop a “total maximum daily load (TMDL)” for a number of pollutants, including nutrients for these “water quality limited” waters. A TMDL is defined as “the level of pollution or pollutant load below which a water body will meet water quality standards and thereby allow use goals such as drinking water supply, swimming and fishing, or shellfish harvesting”. In ID, approximately 36% of streams were identified as not meeting water quality standards. The TMDL for the upper and middle Snake River was set at 0.075 mg total P L⁻¹.
- Idaho Statute Title 37 Chapter 4 Section 37-40, passed in 1999 requires that all dairy farms shall have a nutrient management plan approved by the Idaho State Department of Agriculture. The nutrient management plan shall cover the dairy farm site and other land owned and operated by the dairy farm owner or operator. Nutrient management plans submitted to the department by the dairy farm shall include the names and addresses of each recipient of that dairy farm’s livestock waste, the number of acres to which the livestock waste is applied and the amount of such livestock waste received by each recipient. The information provided in this subsection shall be available to the county in which the dairy farm, or the land upon which the livestock waste is applied, is located. If livestock waste is converted to compost before it leaves the dairy farm, only the first recipient of the compost must be listed in the nutrient management plan as a recipient of livestock waste from the dairy farm. Existing dairy farms were required to submit a nutrient management plan to the department on or before July 1, 2001, and plans are required to be updated every 5 years.

What is a Phosphorus Site Index?

In the early 1990's the U.S. Department of Agriculture (USDA) began to develop assessment tools for areas with water quality problems. While some models such as the Universal Soil Loss Equation (USLE) for erosion, and Groundwater Loading Effects of Agricultural Management Systems (GLEAMS) for ground water pollution, were already being used to screen watersheds for potential agricultural impacts on water quality, there was no model considered suitable for the field-scale assessment of the potential movement of P from soil to water. A group of scientists from universities and governmental agencies met in 1990 to discuss the potential movement of P from soil to water, and later formed a national work group (PICT: Phosphorus Index Core Team) to more formally address this problem. Members of the PICT soon realized that despite the many scientists conducting independent research on soil P, there was a lack of integrated research that could be used to develop the field scale assessment tool for P needed by USDA. Consequently, the first priority of PICT was a simple, field-based, planning tool that could integrate through a multi-parameter matrix, the soil properties, hydrology, and agricultural management practices within a defined geographic area, and thus to assess, in a relative way, the risk for P movement from soil to water. The initial goals of the PICT team were:

- *To develop an easily used field rating system (the **Phosphorus Site Index**) for Cooperative Extension, Natural Resource Conservation Service (NRCS) technical staff, crop consultants, farmers or others that rates soils according to the potential for P loss to surface waters*
- *To relate the P Site Index to the sensitivity of receiving waters to eutrophication.* This is a vital task because soil P is only an environmental concern if a transport process exists that can carry particulate or soluble P to surface waters where eutrophication is limited by P.
- *To facilitate adaptation of the P Site Index to site specific situations.* The variability in soils, crops, climates and surface waters makes it essential that each state or region modify the parameters and interpretation given in the original P Index to best fit local conditions.
- *To develop agricultural management practices that will minimize the buildup of soil P to excessive levels and the transport of P from soils to sensitive water bodies.*

The *P Site Index* is designed to provide a systematic assessment of the risks of P loss from soils, but does not attempt to estimate the actual quantity of P lost in runoff. Knowledge of this risk not only allows us to design best management practices (BMPs) that can reduce agricultural P losses to surface waters, but to more effectively prioritize the locations where their implementation will have the greatest water quality benefits.

It has long been known that P loss depends on not only the amount of P in or added to a soil but the transport processes that control soil and water movement from fields to waterways. Therefore, when assessing the risk of P loss from soil to water, it is important that we not focus strictly on measures of P, such as agronomic soil test P value. Rather a much broader, multi-disciplinary approach is needed; one that recognizes that P loss will vary among watersheds and soils, due to the rate and type of soil amendments used, and due to the wide diversity in soils, crop management practices, topography, and hydrology. At a minimum, any risk assessment process for soil P shall include the following:

- Characteristics of the P source (fertilizer, manure, biosolids) that influence its solubility and thus the potential for movement or retention of P once the source has been applied to a soil.
- The concentration and bioavailability of P in soils susceptible to loss by erosion.
- The potential for soluble P release from soils into surface runoff or subsurface drainage.
- The effect of other factors, such as hydrology, topography, soil, crop, and P source management practices, on the potential for P movement from soil to water.
- Any “channel processes” occurring in streams, field ditches, etc. that mitigate or enhance P transport into surface waters.
- The sensitivity of surface waters to P and the proximity of these waters to agricultural soils.

In summary, when resources are limited, it is critical to target areas where the interaction of P source, P management, and P transport processes result in the most serious risk of losses of P to surface and shallow ground waters. This is the fundamental goal of the *P Site Index*.

Phosphorus Site Index

The *P Site Index* has two separate components (Table 1). Part A characterizes the risk of P loss based on site-specific soil properties and hydrologic considerations. Part B characterizes the risk of P loss based on site-specific past and current nutrient management practices that affect the concentration of P in the soil (soil test P) and the potential for P loss due to management of inorganic (fertilizer) and organic (manures, composts, etc.) P sources. Parts A and B are summarized below, followed by a detailed discussion and descriptions of each component of the two parts. Generalized interpretations of the *P Site Index* values are given in Table 2.

Part A: Phosphorus Loss Potential Due to Site and Transport Characteristics

Surface transport mechanisms, i.e. soil erosion and runoff are generally the main mechanisms by which P is exported from agricultural fields to receiving waters. In some areas, leaching of P can also be a significant method of P export, especially in areas with artificial subsurface drainage (e.g. tiles, mole drains) high water tables, or shallow soils overlying basalt. Therefore, the considerations of the methods of P transport factors affecting these transport mechanisms are critical to an understanding of P losses from watersheds. Part A includes the following four factors: (i) soil erodibility; (ii) soil surface runoff index; (iii) leaching potential; and (iv) distance from edge of field to surface water.

Part B: Phosphorus Loss Potential Due to P Source and Management Practices

Phosphorus losses are also related to the amount and forms of P at a site which can potentially be transported to ground or surface waters. The main sources of P at any site that must be considered in assessing the risk of P loss are (i) soil P (particulate and dissolved), a reflection of natural soil properties and past management practices; and (ii) P inputs such as inorganic fertilizers and organic P sources (manures, composts, biosolids). Also of importance are the management practices used for all P inputs, such as the rate, method, and timing of fertilizer and manure applications, as these factors will influence whether or not P sources will have negative impacts on water quality. Part B includes the following three factors: (i) soil test P value; (ii) P applications rate; and (iii) P application method.

Table 1. The *Phosphorus Site Index* proposed for use in Idaho

Part A: Phosphorus loss potential due to site and transport characteristics

Characteristics	Phosphorus Loss Rating					Field Value
Soil Erodibility	Very Low 0	Low 1	Medium 2	High 4	Very High 8	
Soil Surface Runoff Index – Surface Irrigated	No Runoff 0	Water runs off less than 50% of the irrigation set time 4		Water runs off more than 50% of the irrigation set time 8		
Soil Surface Runoff Index – Sprinkler or Non-Irrigated	Very Low 0	Low 1	Medium 2	High 4	Very High 8	
Leaching Potential	Low 1		Medium 2	High 4		
Distance from Edge of Field to Surface Water	> 2,640' 0		200-2,640' 2	< 200' 8		

Part B: Phosphorus loss potential due to P source and management practices.

Characteristics	Phosphorus Loss Rating					Field Value
	Very Low	Low	Medium	High	Very High	
Soil Test P value	0.05 x [Olsen Soil Test P (ppm)] 0.025 x Bray Soil Test P (ppm)]					
P Application Rate (lbs P ₂ O ₅ applied per acre)	No Application 0	< 60 1	60 – 150 2	151 – 300 4	>300 8	
P Application Method	None Applied 0	Incorporated within 2 days or injected/banded below surface at least 3” 1	Incorporated within 7 days of application 2	Incorporated > 7 days or no incorporation when applied between February 16 and December 15 4	Application between December 16 and February 15 8	

Table 2. Generalized interpretations of the *P Site Index*.

<i>P Site Index</i> Value	Generalized Interpretation of the <i>P Site Index</i> Value
< 75	LOW potential for P movement from this site given current management practices and site characteristics. There is a low probability of an adverse impact to surface waters from P losses from this site. Nitrogen-based nutrient management planning is satisfactory for this site. Soil P levels and P loss potential may increase in the future due to N-based nutrient management planning.
75 - 150	MEDIUM potential for P movement from this site given current management practices and site characteristics. Phosphorus applications shall be limited to the amount expected to be removed from the field by crop harvest (crop uptake) or soil test-based P application recommendations. Testing of manure P prior to application is required.
151 – 225	HIGH potential for P movement from this site given the current management practices and site characteristics. Phosphorus applications shall be limited to 50% of crop P uptake. Testing of manure P prior to application is required.
> 225	VERY HIGH potential for P movement from this site given current management practices and site characteristics. No P shall be applied to this site.

Usage of the Idaho *Phosphorus Site Index*

The Phosphorus Site Index is a risk assessment tool to help determine the potential for off-site transport of phosphorus from agricultural fields. It is intended to be used as an integral and interactive part of the nutrient management plan to help guide applications of manure and fertilizers to minimize potential P losses from agricultural fields, and to identify fields that may require additional management to reduce P losses even when P applications are not planned. The PSI is also a valuable educational tool to assist producers in recognizing high risk areas, allowing them to focus conservation practices where they would be of most value.

A PSI rating shall be done for each field. Fields that do not receive manure and fertilizer shall only be assessed once until there is a planned application of P. The PSI shall be calculated prior to P application for each field using the planned management and P application rate along with current soil test P results. The risk rating will determine whether or not the P application on the field is allowable, given the current management. For example, if the risk assessment was completed with inputs for the field source factors (soil test P, planned P application rates, and planned application method and timing) and the field received a low rating, then application and management can continue according to plan. If, however, the risk rating is in a medium category, P application will be limited to crop uptake. If the risk rating is in a higher category, BMPs will need to be implemented on the field in order to reduce the potential for P loss, and/or the P application rates must be limited or prohibited in order to reduce the risk of P losses from the field. Producers can receive full credit for maximum of two (2) BMPs per field at any given time. In addition, testing of manure prior to application will be required for fields having a risk rating above low.

When a perennial crop such as alfalfa is part of the rotation, or when allowable manure application rates are below a reasonable application rate (<10 tons/acre for manure and <5 tons/acre for composted manure) then a producer may be allowed to apply up to a four year application rate at one time with no further application over the remainder of the time period that the nutrients have been allocated to. For example, a field with a medium rating beginning a four-year rotation of alfalfa could apply a maximum of four times the annual expected crop P uptake rate in the first year with no additional P application for the next three years; or a field with a high rating beginning a four-year rotation of alfalfa could apply a maximum of two times the annual expected crop P uptake rate in the first year, and the following three years of alfalfa could receive no additional P.

Phosphorus Site Index:

Part A: Phosphorus Loss Potential Due to Site and Transport Characteristics

Soil Erosion

Phosphorus is strongly sorbed by soils, therefore erosion of soil materials dominates the movement of particulate P in landscapes (Bjorneberg et al., 2002; Leytem and Westermann, 2003). Up to 90% of the P transported from surface irrigated crops is transported with eroded sediment (Berg and Carter, 1980). In contrast to rainfall, irrigation is a managed event. Runoff and soil erosion should be minimal from properly managed sprinkler irrigation or drip irrigation. Water flowing over soil during surface irrigation will detach and transport sediment. Annual soil loss from furrow irrigated fields can range from less than 1 to greater than 100 tons per acre (Berg and Carter, 1980; Koluvek et al., 1993). Typically, greater than 90% of the P in surface irrigation runoff from clean-tilled row-crop fields is transported with eroded sediment. Conversely, when erosion is minimal from crops such as alfalfa and pasture, greater than 90% of the total P is dissolved in the runoff water (Berg and Carter, 1980). Total P concentration in surface irrigation runoff correlates directly with sediment concentration (Fitzsimmons et al., 1972, Westermann et al., 2001). Dissolved reactive P concentration in surface irrigation runoff, on the other hand, correlates with soil test P concentration, but not with sediment concentration (Westermann et al., 2001). During detachment and movement of sediment in runoff, the finer-sized fractions of source material are preferentially eroded. Thus, the P content and reactivity of eroded particulate material is usually greater than the source soil (Carter et al., 1974; Sharpley et al., 1985). Therefore, to minimize P loss in the landscape, it is essential to control soil erosion. Particulate P movement in the landscape is a complex function of rainfall, irrigation, soil properties affecting infiltration and runoff of irrigation/rainfall/snowmelt, and soil management factors affecting erosion. Numerous management practices that minimize P loss by erosion are available including filter strips, contour tillage, cover crops, use of polyacrylamide and impoundments or small reservoirs.

Soil erosion can be estimated from erosion prediction models such as the Universal Soil Loss Equation (USLE) or the Revised Universal Soil Loss Equation (RUSLE) for water erosion and Wind Erosion Equation (WEQ) for wind erosion. However, neither USLE nor RUSLE can accurately predict irrigation erosion. Therefore, the potential for soil erosion is based on the erodibility of the soil along with the predominant slope of the field. While this factor does not predict sediment transport and delivery to a water body, it does indicate the potential for sediment and attached P movement across the slope or unsheltered distance toward a water body.

For the *Phosphorous Site Index*, the potential for soil erosion loss is determined by the erodibility of the soil (K_w factor) along with the slope of the field Table 3.

Table 3. Soil erodibility factor

Kw factor - surface mineral layer Whole Soil	Slope Gradients				
	< 2%	2 – 5%	5 – 10%	10 – 15%	> 15%
≤ 0.10 Very low erodibility	Very Low	Very Low	Very Low	Very Low	Low
0.11 – 0.20 Low erodibility	Very Low	Very Low	Very Low	Low	Medium
0.21 – 0.32 Moderate erodibility	Very Low	Low	Low	Medium	High
0.33 – 0.43 High erodibility	Low	Low	Medium	High	Very High
0.44 – 0.64 Very high erodibility	Low	Medium	High	Very High	Very High

All factors shall be determined by using the NRCS soil survey data (Web Soil Survey) with field verification of the predominant slope in the field. **The soil erodibility value will range from very low to very high and shall be assigned a value of 0 (very low) to 8 (very high) and used in the calculation of the *P Site Index* (Table 1).**

Runoff Index

Dissolved P (DP) is another important source of P that is transported in surface runoff. Dissolved P exists mainly in the form of orthophosphate, which is available immediately for uptake by algae and other aquatic plants. The first step in the movement of DP in runoff is the desorption, dissolution, and extraction of P from soils, crop residues, and surface applied fertilizer and manure (Sharpley et al., 1994). These processes occur as irrigation water, rainfall, or snowmelt water interacts with a thin layer of surface soil (0.04 to 0.12 in) before leaving the field as runoff or leaching downward in the soil profile (Sharpley, 1995). The soil test P content of surface soils has been found to be directly related to DP concentrations in runoff. Field studies have shown that P losses by surface runoff are greater when soil test P values are above the agronomic optimum range (Turner et al., 2004). Laboratory research has also shown that soils with high agronomic soil test P values are more likely to have high concentrations of soluble, desorbable, and bioavailable P (Paulter and Sims, 2000; Sibbensen and Sharpley, 1997; Sims, 1998b). In furrow irrigation runoff, even soil with low soil test P can have high runoff DP concentrations (Westermann et al., 2001).

For the *P Site Index*, soil runoff index is determined differently for surface irrigated vs sprinkler irrigated or fields with no irrigation. For surface irrigated fields use Table 4, for sprinkler irrigated or non-irrigated fields use Table 5.

Table 4. Runoff index for surface irrigated fields:

Criteria	Value
Fields with no runoff	0
Fields with water running off less than 50% of the irrigation set time	4
Fields with water running off 50% or more of the irrigation set time	8

Table 5. Runoff index for sprinkler or non-irrigated fields.

Hydrologic Soil Group	Slope Gradients				
	< 2%	2 – 5%	5 – 10%	10 – 15%	> 15%
A: Low Runoff Potential	Very Low	Very Low	Low	Medium	High
B: Moderately Low Runoff Potential	Very Low	Low	Medium	High	High
C: Moderately High Runoff Potential	Very Low	Medium	Medium	High	Very High
D, A/D, B/D, C/D: High Runoff Potential	Low	Medium	High	Very High	Very High

All factors shall be determined by using the NRCS soil survey data (Web Soil Survey) with field verification of the predominant slope in the field.

Leaching Potential

While surface transport processes are the major contributing factors in P transport from soil to water in most cases, leaching of P can contribute significant amounts of P to surface waters in some situations, such as in areas where there is relatively flat topography, high water tables, shallow soils over basalt and any artificial drainage system (e.g. ditches, subsurface drains). While P leaching is typically considered to be small there is potential for significant movement of P through the soil profile when soil P values increase to very high or excessive values due to long-term over-fertilization or manuring (Sims et al., 1998). Whether this leached P will reach surface waters depends on the depth to which it has leached and the hydrology of the site in question. In flat areas with shallow groundwater levels, P loss by leaching through soils contributes significantly to the phosphorus loads of streams (Culley et al., 1983; Heathwaite & Dils, 2000). Soils that are poorly drained with high water tables have a higher possibility of P loss than soils that are well drained with deep water tables. Also soils that are shallow (<24") overlying basalt have a higher possibility of P loss than deeper soils. It is common in poorly drained soils to have water tables rise to the soil surface during the winter and spring months, during this time there is the potential for release of P into these drainage waters which can then be carried to nearby streams via subsurface flow. When soils are wet (during spring and late fall) or during time periods when irrigation exceeds ET, shallow soils can potentially leach P into the underlying basalt which can then be carried to surface waters (i.e. springs).

For the *P Site Index*, leaching potential shall be based on a USDA-NRCS categorization scheme based on the soil hydrologic group, predominant slope, saturated hydraulic conductivity, depth to high water table (HWT) and depth to bedrock Table 6. This information shall be determined through site inspection and the NRCS Web Soil Survey.

Table 6. Leaching potential.

Soil Leaching Potential	Hydrologic Group A	Hydrologic Group B	Hydrologic Group C	Hydrologic Group D
Low	NA	NA	NA	All <u>except</u> : <ul style="list-style-type: none"> • Apparent HWT • Depth to bedrock < 24"
Medium	<ul style="list-style-type: none"> • Slope > 6% • No apparent HWT and Depth to bedrock > 24" 	<ul style="list-style-type: none"> • Slope > 6% or slope $\leq 6\%$ with $K_{sat} < 0.24$ in/hr • No apparent HWT and Depth to bedrock > 24" 	All <u>except</u> : <ul style="list-style-type: none"> • Apparent HWT • Depth to bedrock < 24" 	NA
High	<ul style="list-style-type: none"> • Slope < 6% • Apparent HWT or Depth to bedrock < 24" 	<ul style="list-style-type: none"> • Slope < 6% with $K_{sat} > 0.24$ in/hr • Apparent HWT or Depth to bedrock < 24" 	<ul style="list-style-type: none"> • Apparent HWT • Depth to bedrock < 24" 	<ul style="list-style-type: none"> • Apparent HWT • Depth to bedrock < 24"

High Water Table (HWT) is defined as a saturated layer < 24" from the surface anytime during the year.

Distance from Edge of Field to Surface Water

Another factor that affects the risk of P transport from soils to surface waters is the distance between the P source (i.e., the field) and the receiving waters. In some areas, the nearest water body may be a mile or more from the field being evaluated with no connectivity between the field and surface water; in these cases, even high levels of soil P may have low risk for nonpoint source pollution since the potential for transport to the water body is low. On the other hand, fields that are directly connected to surface water, such as surface irrigated fields with tailwater ditches, directly convey runoff water to surface water bodies through the return flow system. In these cases, even fields with low soil P can convey a large amount of both particulate and soluble P to surface waters.

The *P Site Index* shall take into account the distance from field edge to the nearest surface water body or other conveyance system connected to surface water (tailwater ditches, return flow ditches, laterals (Table 7).

Table 7. Distance from edge of field to surface water

Distance From Edge of Field to Surface Water	Value
> 2,640' (0.5 mile)	0
200' to 2,640'	2
< 200'	8

Best Management Practices for Reducing Transport Losses of P

There are several best management practices (BMPs) that can reduce the transport and loss of P from agricultural fields. In many situations, a combination of management practices is more effective than one BMP alone. To account for the effect of BMPs on the off-site transport of P from agricultural fields, a reduction in the overall transport factor is applied with varying BMPs that could be implemented on farm.

Contour farming, i.e. planting across the slope instead of up and down the hill can reduce soil erosion significantly. It is estimated that contour farming can reduce sediment loss by 20 to 50% depending on the slope of the field (Wischmeier and Smith, 1978). Keeping soil surfaces covered through cover or green manure crops can reduce losses of P by reducing erosion losses, however in some cases soluble P is either not affected or can increase. Sharpley and Smith (1991) reported reductions in total P losses of 54 to 66% with the use of cover crops while soluble P was reduced by 0 to 63%. The use of perennial crops such as alfalfa will also reduce the amount of sediment and therefore P leaving the field.

The installation of a dike or a berm that captures runoff from the field will prevent the loss of both soluble and total P. The effectiveness will depend on the holding capacity of the retention area. The use of drip irrigation vs. surface irrigation can significantly reduce the amount of runoff and therefore P that is transported off site. Mchugh et al. (2008) reported a 90% reduction in total P loss from fields with subsurface drip irrigation vs. furrow irrigation. Vegetative filter strips can trap sediment thereby reducing the offsite transport of P. Abu-Zreig et al. (2003) found that filter strips removed 31 to 89% of total P with filter length being the predominant factor affecting filter strip efficacy. The use of polyacrylamide (PAM) with irrigation has been shown to reduce losses of P from both furrow and sprinkler irrigated fields. Applying PAM with irrigation water or directly to furrow soil reduced soil erosion more than 90% on research plots (Lentz et al. 1992, Sojka and Lentz 1997, Trout et al. 1995). A conservative estimate for production fields is 50% to 80% reduction in soil loss. By reducing soil erosion, PAM treatment also reduced total P concentrations in runoff water (Lentz et al. 1998) but had little impact on dissolved P concentrations (Bjorneberg and Lentz, 2005). When used with sprinkler irrigation PAM has been shown to reduce P losses by 30%, but the effectiveness of PAM is minimal after three irrigations (Bjorneberg et al., 2000). Conservation tillage can also reduce soil erodibility and increase residue in furrows, both of which reduce soil loss to irrigation return flow (Carter and Berg 1991).

Sediment ponds remove suspended material from water by reducing flow velocity to allow particles to settle. Sediment ponds also remove nutrients associated with sediment particles. A large pond removed 65% to 75% of the sediment and 25% to 33% of the total P that entered the pond (Brown et al. 1981). A smaller percentage of total P was removed because only the P associated with sediment was removed and a large portion of the total P flowing into the pond was dissolved. Average total P concentrations significantly decreased by 13 to 42% in five ponds with 2 to 15 hour retention times, while dissolved P concentrations only decreased 7 to 16% in three of the five ponds (Bjorneberg et al., 2015). Dissolved P concentration may actually be greater in pond outflow than pond inflow because P may continue to desorb from sediment as water flows through the pond. Implementing sediment control practices on an 800 ha (2,000 ac) irrigation tract in the Columbia Basin of Washington reduced P discharges by 50% (King et al. 1982). Tailwater recovery systems that capture runoff from furrow irrigated fields and pump it back for re-use as irrigation water should eliminate the loss of P from the system during the irrigation system, provided that no water leaves the field.

The reduction in transport factor due to the implementation of BMPs is listed in Table 8. For each BMP implemented, the transport factor shall be reduced by the amounts listed in the tables. Combinations of BMPs will reduce the transport factor sequentially, for example if you had a score of 36 and you implemented contour farming and a sediment basin your score would then be:

$$36 - (0.2 \times 36) = 28.8 - (0.6 \times 28.8) = \mathbf{11.5}$$

Table 8. Management practices to reduce the loss of P from fields.

Management Practice ¹	BMP Coefficient
Contour Farming	0.20
Cover & Green Manure Crop	0.30
Dike or Berm	0.40 or 0.80
Drip Irrigation	0.80
Filter Strip ³	0.35
PAM - Furrow Irrigation	0.60
PAM – Sprinkler Irrigation	0.30
Residue Management/Conservation Tillage ⁴	0.30
Sediment Basin	0.30
Tailwater Recovery & Pumpback Systems ²	0.80
Established Perennial Crop ⁵	0.50

¹BMPs designed by NRCS can receive full credit; otherwise the BMPs must meet the requirements set out in the BMP definition section.

Phosphorus Site Index

Part A: Phosphorus Loss Potential Due to Site and Transport Characteristics

Sample Calculation

Part A: Phosphorus Loss Potential Due to Site and Transport Characteristics

Calculation of the Total Site and Transport Value for Part A of the P Site Index

Once the values for soil erodibility, soil surface runoff, leaching potential and distance from edge of field to surface water have been obtained, these values shall be added together to obtain a total site and transport value (sum for Part A).

EXAMPLE:

A field located in the Magic Valley with a Portneuf silt loam soil, 1.5% slope, that is surface irrigated with water running off of the field >50% of the irrigation set time. Hydrologic soil group C, K_w factor for erosion is 0.43, K_{sat} 0.2 to 0.6 in/hr, depth to water table > 80". The surface irrigation runoff flows directly into the return flow system.

Soil Erodibility

Using Table 3, a K_w factor of 0.43 with a slope of < 2% puts this in the "Low" category, with a value of **1** (Table 1).

Soil Surface Runoff

This field is surface irrigated with runoff >50% of the set time, which is a value of **8** (Table 1).

Leaching Potential

This soil is in Hydrologic Group C without a high water table and is not a shallow soil, which is a medium risk (Table 6) with a value of **2** (Table 1).

Distance from edge of field to surface water

Since the runoff from this field flows directly into the return flow system the distance from edge of field to surface water is 0' which would be a value of **8** (Table 1).

All of the field values in Part A are then added together to obtain the Total Site Transport Value

$$1 + 8 + 2 + 8 = 19$$

**If this site had a tailwater recovery and pumpback system the transport value would be reduced by 80%*

$$19 - (19 \times 0.8) = 3.8$$

Sum of Part A = 3.8

Phosphorus Site Index

Part B: Phosphorus Loss Potential Due to P Source and Management Practices

Soil Test Phosphorus

Phosphorus exists in many forms in the soil, both inorganic and organic. Major inorganic forms are soluble, adsorbed, precipitated and minerals containing Al, Ca, and Fe. Each “pool” of soil P has a characteristic reactivity and potential for movement in either soluble or particulate forms. Iron and aluminum oxides, prevalent in most soils, strongly adsorb P under acidic conditions; under alkaline conditions, adsorption and precipitation are fostered by the presence of free calcium ions and calcium carbonate (Leytem and Westermann, 2003). Microorganisms and plant uptake can immobilize inorganic P by incorporation into biomass. Conversely, as organic materials decompose, soluble P can be released and made available for transport. How much P exists in each of these pools is determined by soil type, mineralogy, microbial activity, cropping, and fertilization practices (with both inorganic and organic sources of P).

Past and present research has demonstrated that there is a positive relationship between soil test P and dissolved P in surface runoff; that is, as soil test P increases, dissolved P in runoff also increases (Westermann et al., 2001; Turner et al., 2004). However, this relationship varies with soil type, cropping system and nature of the runoff episode. In addition to impacting P levels in surface waters, soil test P has also been found to affect P loss in drainage waters (Heckrath et al., 1995; Sims et al, 1998). Thus, as soils are fertilized to levels exceeding the soil test P values considered optimum for plant growth, the potential for P to be released to soil solution and transported by surface runoff, leaching, subsurface movement and even groundwater increases. Therefore, it is important to include a measure of the current soil test P values in any risk assessment tool for P.

For the *P Site Index*, soil test P values are expressed in ppm of either Olsen or Bray P. Olsen P is the most common (and appropriate) soil test for Idaho’s calcareous soils. However certain regions of the state with lower soil pH (<7.4) may also use the Bray method for determination of soil test P.

P Site Index Value For Table 1 = $0.05 \times \text{Olsen Soil Test P (ppm)}$, or

P Site Index Value For Table 1 = $0.025 \times \text{Bray Soil Test P (ppm)}$

Phosphorus Application Rate

The addition of fertilizer P or organic P to a field will usually increase the amount of P available for transport to surface waters. The potential for P loss when fertilizers, manures, or other P sources are applied is influenced by the rate, timing, and method of application and by the form of the P source (e.g. organic vs. inorganic). These factors also interact with others, such as the timing and duration of subsequent irrigation, rainfall or snowmelt and the type of soil cover present (vegetation, crop residues, etc.; Sharpley et al., 1993). Past research has established a clear relationship between the rate of fertilizer P applied and the amount of P transported in runoff (Baker and Laflen, 1982; Romkens and Nelson, 1974). These studies showed a linear relationship between the amount of P added as superphosphate fertilizer and P loss in runoff. Using manure as the source of P, Westerman et al. (1983) also demonstrated a direct relationship between the quality of runoff water and the application of manure. Therefore, it is important that the amount of P added to a site is accounted for in any risk assessment for nonpoint source pollution by P.

The P application rate is the amount of P in pounds P_2O_5 per acre that is applied to the crop. The amount of P in manures shall be determined either by sample submission for testing by a certified laboratory or calculated using Table 10.

Table 9. Phosphorus application rate. Corresponding value to be included in the *P Site Index* (Table 1).

P Application Rate (lbs P_2O_5 applied per acre)	Value
No Application	0
< 60	1
60 - 150	2
151 - 300	4
> 300	8

Table 10. Phosphorus concentration of dairy manure

Dairy Manure Type	%P_2O_5 on a wet basis
Solid stacked	0.57
Composted	0.69
Lagoon liquid	0.03
Slurry	0.30

Phosphorus Application Method

Directly related to the amount of fertilizer and organic P sources applied to a field is the method and timing of the application. Baker and Laflen (1982) determined that the dissolved P concentrations of runoff from areas receiving broadcast fertilizer P average 100 times more than from areas where comparable rates were applied 5cm below the soil surface. Muller et al (1984) showed that incorporation of dairy manure reduced total P losses in runoff five-fold compared to areas with broadcast applications. Surface applications of fertilizers and manures decrease the potential interaction of P with the soil, and therefore increase the availability of P for runoff from the site. When fertilizers and manures are incorporated into the soil, the soil is better able to absorb the added P and thus decrease the likelihood of P loss. It is particularly important that fertilizers and manures are not surface applied during times when there is no plant growth, when the soil is frozen, during or shortly before periods of irrigation, intense storms or times of the year when fields are generally flooded due to snowmelt. The major portion of annual P loss in runoff generally results from one or two intense transport periods. If P applications are made during any of these high risk times, the percentage of applied P lost would be higher than if applications are made when runoff probabilities are lower (Edwards et al., 1992). Also, the time between application of P and the first runoff even is important. Westerman and Overcash (1980) applied manure to plots and simulated rainfall at intervals ranging from one to three days following manure application. Total P concentrations in the runoff were reduced by 90% by delaying the first runoff event for three days. In order to manage manure and fertilizers to decrease potential for P transport off-site, they must be either applied below the surface or incorporated into the soil within a short period of time and also be applied shortly before the growing season when available P can be utilized by the plant.

For the *P site Index*: To determine the field value for application methods of P sources, information about the time of year and method of application must be obtained from the nutrient user and assigned values using Table 11.

Table 11. Values of P application methods for inclusion in *P Site Index* (Table 1).

P Application Method	Value
None applied	0
Incorporated within 2 day or injected/banded below surface at least 2"	1
Incorporated within 7 days of application	2
Incorporated >7 days or no incorporation when applied between February 16 and December 15	4
Application between December 16 and February 15	8

The Phosphorus Site Index
Part B: Phosphorus Loss Potential Due to P Source and Management Practices
Sample Calculation

Part B: Phosphorus Loss Potential Due to P Source and Management Practices

Calculation of the Total P Source and Management Value for Part B of the P Site Index

Once the values for soil test P, P application rate and P application method have been obtained, these values shall be added together to obtain a total P source and management practice value (sum for Part B).

EXAMPLE:

The field described for calculation of Part A has an Olsen soil test P value of 80 and solid manure is applied at 50 tons/acre in October and is not incorporated.

Soil Test P value

Olsen P of 80 x 0.05 = **4**

P Application Rate

50 tons/acre = $(50 \times 2,000 \times (0.57/100)) = 570$, this would be a value of **8**

P Application Method

Surface applied between Feb 16 and Dec 15 and not incorporated, this is a value of **4**

All of the field values in Part B are then added together to obtain the Total P Source and Management Value

$$\mathbf{4 + 8 + 4 = 16}$$

Sum of Part B = 16

The Phosphorus Site Index

Calculation and Interpretation of the Overall P Loss Rating for a Site

To find the overall *P Loss Rating* for a site (the final *P Site Index Value*), multiply the total site and transport value from Part A by the total management and source value from Part B as follows:

$$P \text{ Site Index} = [\text{Sum of Part A}] \times [\text{Sum of Part B}]$$

$$\text{Sum of Part A} = 19$$

$$\text{Sum of Part B} = 16$$

$$P \text{ Site Index} = 19 \times 16 \text{ or } 304$$

A *P Site Index* value of **304** is classified as **Very High** (See Tables 2 or 12)

*If a tailwater recover with a pumpback system was used as a BMP then the P Site Index value would be

$$\text{Sum of Part A} = 3.8$$

$$\text{Sum of Part B} = 16$$

$$P \text{ Site Index} = 3.8 \times 16 \text{ or } 61$$

A *P Site Index* value of **61** is classified as **Low** (See Tables 2 or 12)

Interpretation of the *P Site Index Value*

Compare the *P Site Index* value calculated as show above with the ranges given in Table 12 for Low, Medium, High, or Very High risk of P loss. **It is important to remember that a *P Site Index* value is an indication of the degree of risk of P loss, not a quantitative prediction of the actual amount of P lost from a given field.** Fields in the “Low” category are expected to have a lower potential for P losses than fields in the “Medium P loss rating category, while fields in the “Medium P loss rating category are expected to have a relatively lower potential for P loss than fields in the “High” P loss rating category, and so on. The numeric values used in Table 12 to separate the various P loss categories are based on the best professional judgement of the individuals involved in the development of the *P Site Index* using data from fields and farms in Idaho where field evaluations were conducted in 2017.

Table 12. Interpretation of the *Phosphorus Site Index Value*

<i>P Site Index Value</i>	Generalized Interpretation of the <i>P Site Index Value</i>
< 75	LOW potential for P movement from this site given current management practices and site characteristics. There is a low probability of an adverse impact to surface waters from P losses from this site. Nitrogen-based nutrient management planning is satisfactory for this site. Soil P levels and P loss potential may increase in the future due to N-based nutrient management planning.
75 - 150	MEDIUM potential for P movement from this site given current management practices and site characteristics. Phosphorus applications shall be limited to the amount expected to be removed from the field by crop harvest (crop uptake) or soil test-based P application recommendations. Testing of manure P prior to application is required.
151 – 225	HIGH potential for P movement from this site given the current management practices and site characteristics. Phosphorus applications shall be limited to 50% of crop P uptake. Testing of manure P prior to application is required.
> 225	VERY HIGH potential for P movement from this site given current management practices and site characteristics. No P shall be applied to this site.

Best Management Practice Definitions

Contour Farming. Farming sloping land in such a way that planting is done on the contour (perpendicular to the slope direction). This practice would apply to fields having a slope of 2% or greater. When converting from surface to sprinkler irrigation, this can be as simple as planting across the direction of the surface water flow. For other more complex settings, the maximum row grade shall not exceed half of the downslope grade up to a maximum of 4%. The minimum ridge height shall be 2 inches for row spacing greater than 10 inches and 1 inch for row spacing less than 10 inches.

Cover & Green Manure Crop. A cover and/or green manure crop is a close-growing crop primarily for seasonal protection and soil improvement. This practice reduces erosion by protecting the soil surface. Cover crops must be established (have vegetative cover over a minimum of 30% of the soil) by November 1 and must be maintained to within 30 days prior to planting the following crop. There shall be a minimum of 2 to 3 plants per square foot (about 100,000 plants/acre).

Dike or Berm. This practice applies to non-surface irrigated fields only and is comprised of an embankment to retain water on the field. The dike or berm must be engineered to retain runoff from a 25 year 24 hour storm event (0.8 BMP coefficient) or from 1 inch of runoff from the field (0.4 BMP coefficient).

Drip Irrigation. The credit for implementing this practice only applies when switching from surface irrigation to drip irrigation. A drip irrigation system shall be comprised of an irrigation system with orifices, emitters or perforated pipe that applies water directly to the root zone or soil surface. This practice efficiently applies water to the soil surface with low probability of runoff, as determined using the calculation in Table 5.

Filter Strip. A filter strip is a strip of permanent herbaceous dense vegetation in an area where runoff occurs. A filter strip can only be used on fields having < 10% slope. Ideally they are perpendicular to the flow of water and the runoff from the source area is such that flow through the strip is in the form of sheet runoff. Channeling of water through a filter strip will severely reduce its effectiveness. Filter strips must be a minimum of 20 feet in length. If the length of the field contributing runoff to the filter strip is greater than 1000 feet, then the minimum filter strip width shall be 50 feet. They must be irrigated and maintained so that there is a minimum of 75% vegetative cover. The seeding rate shall be sufficient to ensure that the plant spacing does not exceed 4 inches (about 16-18 plants per square foot).

Polyacrylamide (PAM). PAM is an organic polymer that stabilizes the soil surface when applied with irrigation water. This practice can increase infiltration and reduce soil erosion. The PAM must be a soluble anionic polyacrylamide. Standards for proper implementation of this BMP shall follow the NRCS Conservation Practice Standard “Anionic Polyacrylamide (PAM) Application” (450-CPS-1).

Residue Management/Conservation Tillage. is any method of soil cultivation that leaves the previous year crop residue cover on the soil surface (such as corn stock or wheat stubble).. Conservation tillage must result in crop residue remaining on at least 30% of the soil surface. This practice reduces soil erosion by protecting the soil surface.

Sediment Basin. A basin or pond constructed to collect and retain sediment. This practice slows the velocity of flowing water which allows sediment to settle in the basin. Sediment basin size must be at least 500 cubic feet per acre of drainage area (20,000 ft³ for 40 acre field or 20 ft x 200 ft x 5 ft). The length-to-width ratio shall be 2 to 1 or greater with a minimum depth of 3 feet. Sediment basins must be cleaned on an annual basis or more frequently.

Tailwater Recovery & Pumpback Systems. This practice applies to surface irrigated fields only. Design standards and management must follow the ASABE Engineering Practice Standard 408.3 “Surface Irrigation Runoff Reuse Systems”. Irrigation runoff reuse systems have four basic components: 1) runoff collection and conveyance channels (tailwater ditches, drains), 2) storage reservoir (tailwater pit, pond, sump), 3) pumping plant (reuse, return, pumpback pump), and 4) delivery pipe (return, pumpback pipe). Runoff from irrigated fields is intercepted by a system of open channels or pipelines and conveyed by gravity to a storage reservoir or pumping plant. Capacity of the channels and pipelines shall be sufficient to convey the maximum expected runoff rate from irrigation. Also, the collection system must be able to safely convey or bypass runoff from precipitation. Reuse systems designed to capture 50% of the application volume will usually capture a large percentage of the total irrigation runoff.

Established Perennial Crop. This is a crop that is grown for more than one year. Perennial crop is considered to be “established” the season after it was seeded.

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NITROGEN MANAGEMENT PLAN WORKSHEET

NAME _____

Crop Year (Harvested) _____

Field ID _____

Acres _____

Crop Nitrogen Management Planning		N Applications/Credits	Recommended/ Planned N	Actual N
1. Crop		<u>Manure/Organic Material N</u>		
2. Production Unit		8. Available N in Manure/Compost (lbs/acre)		
3. Projected Yield (units/acre)		<u>Nitrogen Fertilizers</u>		
4. N Recommended (lbs/acre)		9. Dry/Liquid N (lbs/acre)		
		10. Foliar N (lbs/acre)		
Post Production Actuals		11. Total Available N Applied (lbs/acre)		
5. Actual Yield (units/acre)		<u>Nitrogen Credits</u>		
6. Total N Applied (lbs/acre)		12. Available N in soil (lbs/acre)		
7. N Removed (lbs/acre)		13. N in Irrigation Water (lbs/acre)		
Notes: PSNT Test:		14. Total N Credits (lbs/acre)		
		15. Total N Applied & Available		

Certified By:	
Date:	

Instructions

1. This is the crop that is planted in the year for which the information is recorded.
2. This is the crop yield units ie. bushels, tons, cwt, etc.
3. Projected yield (units/acre). This is the yield that you are anticipating for this crop in this year.
4. N Recommended (lbs/acre). This is the amount of N recommended based on the projected yield.
5. Actual Yield (units/acre). The actual harvested yield on this field for this crop.
6. Total N Applied (lbs/acre). The actual amount of total N that was applied to this crop during this season from line 11.
7. N Removed (lbs/acre). The amount of N that was removed with the crop (calculated by summing all of the biomass removed multiplied by the tissue N concentration of the different biomass pools)
8. Available N in Manure/Compost (lbs/acre). This is the total amount of plant available N applied for the growing season including previous fall applications. Use Table 1 to determine the % PAN of total N in manure/compost/liquid/slurry etc.
9. Dry/Liquid N (lbs/acre). This is the total amount of N applied as fertilizer including starter fertilizer, broadcast applications, in season side-dress applications and any N applied with irrigation.
10. Foliar N (lbs/acre). This is the total amount of N applied as a foliar spray during the growing season.
11. Total Available N Applied (lbs/acre). This is the sum of blocks 8, 9 and 10.
12. Available N in soil (lbs/acre). This is determined from soil samples collected within 8 months of planting. It is preferential to collect a pre-plant soil sample within 3 weeks of planting for the most accurate accounting of N in soil. This must include soils from 0 to 12". The lbs/acre is calculated by multiplying the average ppm N ($\text{NH}_4 + \text{NO}_3$) in the 0 to 12" sample by 4. It is preferential to account for the N in the top 2' of soil. If you have soil samples from 0 to 12" and 12 to 24" you would multiply each sample by 4 and then add them together (0 to 12" ppm N x 4) + (12 to 24" ppm N x 4). Alternatively, if you only have a 0 to 12" soil sample you could multiply the ppm N x 8 to represent the first 2', however this is not as accurate.
13. N in irrigation water (lbs/acre). If irrigation water contains N, the N applied with irrigation water must be included.
14. Total N Credits (lbs/acre). This is the sum of blocks 12 and 13.
15. Total N Applied and Available. This is the sum of blocks 11 and 14.

Table 1. Plant available N in manure

Manure Source	N available (%)
Lagoon Liquid	80
Lagoon Slurry/Sludge	60
Solid Stacked Manure (corral)	30
Composted Manure	10

Appendix B – Facility Production Area Sizing Analysis

AGTEC Lagoon Design



Producer Information		Facility Info	
Name:	Fitzgerald Brothers	Four Brothers Dairy	
Address:	0	0	
City:	Shoshone	Shoshone	
State:	0	0	
Zip Code:	0	0	
County:	Lincoln	Lincoln	
Project Description: EMP Design for the Process water and area of runoff for Barn 1.			

Animal Breakdown

Animal Type	# of Animals	Animal Weight (lbs)	Lincoln County LCO #'s	% Total Manure to Lagoon	Total Manure % to Slurry Pond
Lactating cow 14	1600	1400	0.0	8%	0%
none	0	0	0.0	0%	0%
none	0	0	0.0	0%	0%
none	0	0	0.0	0%	0%
Dairy Cattle 1.5	700	200	560.0	0%	0%
Dairy Cattle 2.5	650	400	390.0	0%	0%
none	0	0	0.0	0%	0%
none	0	0	0.0	0%	0%
none	0	0	0.0	0%	0%
	2950	animals	950.0	au's	

Wash Water Estimates

	Barn 1	0	0	
# Cows milked	1600	0	0	
Stations/side	20	0	0	
Strings/milking	80.0	0.0	0.0	
Milkings per Day	3	0	0	milkings/day
Cow Prep.	960	0	0	gal/day 3 milkings/day 0.2 gal/cow/milking
Bulk Tank	1800	0	0	gal/day
Pipelines	1500	0	0	gal/day 4 cycles/wash 125 gallons/cycle
Claw Backflush	0	0	0	gal/day 0 gal/cycle 0 cycles/wash
Parlor Hand Washdown	1800	0	0	gal/day 30 gal/min 20 min/milking
Deck Sprays	0	0	0	gal/day 0 gal/min 0 runtime sec 240 cycles/day
Deck Flush	0	0	0	gal/day 0 gal/min 0 min/cycle 0 cycles/day
Holding Pen Flush	0	0	0	gal/day 0 gal/min 0 min/cycle 0 cycles/day
Holding Pen Hand Washdown	1800	0	0	gal/day 30 gal/min 20 min/milking
Sprinkler Pen Water Use	0	0	0	gal/day 0 heads 0 gpm/head 0 min/pen 0 % use
Milk Room Cleaning	300	0	0	gal/day
Water Trough Cleaning	986	0	0	gal/day 20 # of troughs 750 gal/trough 2 #/month
Miscellaneous	0	0	0	gal/day
	9,146	-	-	Total Parlor gal/day
	220,098	-	-	180 Day Volume ft3
Manure from Parlor		300	ft3/day	
Storage period		180	days	Slurry Days of Storage 0
Total Manure from Parlor to Lagoon		109,500	ft3	Slurry Pond Volume ft3 -
Years between Solid sludge Cleanout		5	years	Volume Gal -
Sludge Volume		131,400	ft3	982,872 Gallons



Recyclable Water Use

	Barn 1	0	0
Milking Parlor Throughput	160	0	0 Cows/hr
Time Milking Per Day	30.0	0.0	0 hours/day
Plate Cooler Water Use	54000	0	0 Gal/day
Water Cooled Compressor	0	0	0 Gal/day
Water Cooled Vacuum Pump	0	0	0 Gal/day
	54000	0	0 Total Cooling Parlor Volume/day in gallons

Water Use Evaluation

Clean Water Use	54,000 Gal/day
Cow Drinking water use	68,140 Gal/day
Commercial Parlor Use	9,146 Gal/day
Net Excess Cooling Water	0 Gal/day
Yearly Parlor Cooling Volume (amount exceeding that recycled)	0.0 Acre Ft/year

Water Use Totals

Water Use estimates are based on of milk production

Stock water Requirement	76.3 Acre Ft/yr
Commercial Parlor Use	10.2 Acre Ft/yr
Additional Cooling Use	0.0 Acre Ft/yr
Water Use Estimate	86.6 Acre Ft/yr

Total Diversion Rate

0.13 Cubic Feet/Second (CFS)

59 GPM

(this diversion rate is the minimum rate required to pump the above water use estimate 24/7/365)

Lagoon and Waste System Sizing Program



Facility Runoff Calculation

Runoff Areas

		CN #	CN#	Dimensions			
		1 in 5 yr win.	25 yr. 24 hr	Width	Length	#	Square Footage
Roofed Area		Monthly	storm				
	0	100	100	0	0	0	0
	0	100	100	0	0	0	0
	0	100	100	0	0	0	0
Concrete & Asphalt							0
	0	100	100	0	0	0	0
	0	100	100	0	0	0	0
	0	100	100	0	0	0	0
	0	100	100	0	0	0	0
						Sub Total	0
Earthen Site							
Acres <3% Slope	80.3	91	68.5	*43560	2983860 < than 3% slope		
Acres >3% Slope	86.9	100	0	*43560	0 > than 3% slope		
Square Ft <3% Slope			0				
Square Ft >3% Slope			0				
Net Entire Site						2983860 ft^2	
						68.5 Acres	

1 in 5 yr. Winter Numbers - Using NRCS AWMFH 651.1000

*November through April weather data

Climatic Data Station	SHOSHONE
1 in 5 yr. precipitation	8.32 inches
Evaporation	2.1 inches
Net Precipitation	6.22 inches
25 yr. 24 hr. Storm	2 inches

IDAWM Values

	180 day storage	
Runoff amount	1 in 5 yr Winter	25 yr 24 hr Storm
Roofs	0	0 ft3
Concrete	0	0 ft3
Earthen Site	352991	289341 ft3
Subtotal	352991	289341 ft3
Total Runoff To Contain		642332 ft3

Waste Water Storage

Runoff 1 in 5 yr winter	352,991 ft3	2,640,370 gallons
Runoff 25 yr 24 hr storm	289,341 ft3	2,164,270 gallons
Precipitation on Lagoons	241,917 ft3	1,809,541 gallons
Commercial Water	220,098 ft3	1,646,334 gallons
Manure	109,500 ft3	819,060 gallons
Sludge	131,400 ft3	982,872 gallons
Required Storage for 180 days	1,345,247 ft3	10,062,447 gallons
Total Slurry Pond Volume	- ft3	- gallons
Available Storage	1,615,091 ft3	
Total Days of Aval. Storage	216 days	

269,844 ft3 Surplus Storage

Pond Dimensions



Pond Size	B1 Separator Pond	B1 Lagoon 1	B1 Lagoon 2	Calf Berm	SW Pump Pit	
	(ft)	(ft)	(ft)	(ft)	(ft)	
Width Side Slope	3	2	2.7	2	2	
Bottom Width	225	330	423.416	600	77	
Length Side Slope	3	2	2.7	2	2	
Bottom Length	72	166	300	250	67	
Total Depth	4	4.5	15	2	4.5	
Free Board	1	1	2	1	2	
Lagoon Precip ft3	11097	37524	87012	102750	3534	
LW	66	162	289.2	246	59	Total Capacity
LL	219	326	412.616	596	69	1,615,091 ft3
LD	3	3.5	13	1	2.5	12,080,882 gallons
Top length	201	312	342.416	592	59	
Top Width	48	148	219	242	49	Subtotal Capacity
Storage Volume IWMG ft3	35,991	173,115	1,252,387	144,937	8,661	1,615,091 ft3
Storage Volume IWMG Gal	269,213	1,294,898	9,367,857	1,084,131	64,783	12,080,882 gallons
excavated volume (yd3)	1,893	8,400	55,204	10,860	657.33	77,014

Pond Size	0	0	0	0	0	
	(ft)	(ft)	(ft)	(ft)	(ft)	
Width Side Slope	0	0	0	0	0	
Bottom Width	0	0	0	0	0	
Length Side Slope	0	0	0	0	0	
Bottom Length	0	0	0	0	0	
Total Depth	0	0	0	0	0	
Free Board	0	0	0	0	0	
Lagoon Precip ft3	0	0	0	0	0	
LW	0	0	0	0	0	
LL	0	0	0	0	0	
LD	0	0	0	0	0	Sub Total Capacity
Top length	0	0	0	0	0	
Top Width	0	0	0	0	0	
Storage Volume IWMG ft3	-	-	-	-	-	- ft3
Storage Volume IWMG Gal	-	-	-	-	-	- gallons
excavated volume (yd3)	-	-	-	-	-	-

Pond Size	0	0	0	0	0	
	(ft)	(ft)	(ft)	(ft)	(ft)	
Width Side Slope	0	0	0	0	0	
Bottom Width	0	0	0	0	0	
Length Side Slope	0	0	0	0	0	
Bottom Length	0	0	0	0	0	
Total Depth	0	0	0	0	0	
Free Board	0	0	0	0	0	
Lagoon Precip ft3	0	0	0	0	0	
LW	0	0	0	0	0	
LL	0	0	0	0	0	
LD	0	0	0	0	0	Sub Total Capacity
Top length	0	0	0	0	0	
Top Width	0	0	0	0	0	
Storage Volume IWMG ft3	-	-	-	-	-	0 ft3
Storage Volume IWMG Gal	-	-	-	-	-	- gallons
excavated volume (yd3)	-	-	-	-	-	-

AGTEC Lagoon Design



	Producer Information	Facility Info
Name:	Fitzgerald Brothers	Four Brothers Dairy
Address:	0	0
City:	Shoshone	Shoshone
State:	0	0
Zip Code:	0	0
County:	Lincoln	Lincoln

Project Description: EMP Design for the Process water and area of runoff for the Heifer raising area.

Animal Breakdown

Animal Type	# of Animals	Animal Weight (lbs)	Lincoln County LCO #'s	% Total Manure to Lagoon	Total Manure % to Slurry Pond
none	0	0	0.0	0%	0%
none	0	0	0.0	0%	0%
Dry Cow 10	200	1500	0.0	0%	0%
none	0	0	0.0	0%	0%
Dairy Cattle 2.5	2000	400	1600.0	0%	0%
Heifer 7.5	3600	500	2160.0	0%	0%
Heifer 10	1800	850	0.0	0%	0%
Dairy Cattle 2.5	200	650	0.0	0%	0%
none	0	0	0.0	0%	0%
	7800	animals	3760.0	au's	

Wash Water Estimates

	0	0	0	
# Cows milked	0	0	0	
Stations/side	0	0	0	
Strings/milking	0.0	0.0	0.0	
Milkings per Day	0	0	0	milkings/day
Cow Prep.	0	0	0	gal/day 0 milkings/day 0 gal/cow/milking
Bulk Tank	0	0	0	gal/day
Pipelines	0	0	0	gal/day 0 cycles/wash 0 gallons/cycle
Claw Backflush	0	0	0	gal/day 0 gal/cycle 0 cycles/wash
Parlor Hand Washdown	0	0	0	gal/day 0 gal/min 0 min/milking
Deck Sprays	0	0	0	gal/day 0 gal/min 0 runtime sec 0 cycles/day
Deck Flush	0	0	0	gal/day 0 gal/min 0 min/cycle 0 cycles/day
Holding Pen Flush	0	0	0	gal/day 0 gal/min 0 min/cycle 0 cycles/day
Holding Pen Hand Washdown	0	0	0	gal/day 0 gal/min 0 min/milking
Sprinkler Pen Water Use	0	0	0	gal/day 0 heads 0 gpm/head 0 min/pen 0 % use
Milk Room Cleaning	0	0	0	gal/day
Water Trough Cleaning	0	0	0	gal/day 0 # of troughs 0 gal/trough 0 #/month
Miscellaneous	-1	0	0	gal/day
	-	-	-	Total Parlor gal/day
	-	-	-	180 Day Volume ft3
Manure from Parlor		0	ft3/day	
Storage period		180	days	Slurry Days of Storage 0
Total Manure from Parlor to Lagoon		-	ft3	Slurry Pond Volume ft3 -
Years between Solid sludge Cleanout		5	years	Volume Gal -
Sludge Volume		-	ft3	- Gallons



Recyclable Water Use

	0	0	0
Milking Parlor Throughput	0	0	0 Cows/hr
Time Milking Per Day	0.0	0.0	0 hours/day
Plate Cooler Water Use	0	0	0 Gal/day
Water Cooled Compressor	0	0	0 Gal/day
Water Cooled Vacuum Pump	0	0	0 Gal/day
	0	0	0 Total Cooling Parlor Volume/day in gallons

Water Use Evaluation

Clean Water Use	0 Gal/day
Cow Drinking water use	39,044 Gal/day
Commercial Parlor Use	0 Gal/day
Net Excess Cooling Water	0 Gal/day
Yearly Parlor Cooling Volume (amount exceeding that recycled)	0.0 Acre Ft/year

Water Use Totals

Water Use estimates are based on of milk production

Stock water Requirement	43.7 Acre Ft/yr
Commercial Parlor Use	0.0 Acre Ft/yr
Additional Cooling Use	0.0 Acre Ft/yr
Water Use Estimate	43.7 Acre Ft/yr

Total Diversion Rate

0.07 Cubic Feet/Second (CFS)

30 GPM

(this diversion rate is the minimum rate required to pump the above water use estimate 24/7/365)

Lagoon and Waste System Sizing Program



Facility Runoff Calculation

Runoff Areas

	CN #		CN#		Dimensions		#	Square Footage
	1 in 5 yr win.	Monthly	25 yr. 24 hr	storm	Width	Length		
Roofed Area	0	100	100	100	0	0	0	0
	0	100	100	100	0	0	0	0
	0	100	100	100	0	0	0	0
Concrete & Asphalt								0
	0	100	100	100	0	0	0	0
	0	100	100	100	0	0	0	0
	0	100	100	100	0	0	0	0
	0	100	100	100	0	0	0	0
							Sub Total	0
Earthen Site	Acres <3% Slope	80.3	91		58.6	*43560	2552616	< than 3% slope
	Acres >3% Slope	86.9	100		0	*43560	0	> than 3% slope
	Square Ft <3% Slope				0			
	Square Ft >3% Slope				0			
	Net Entire Site						2552616 ft^2	
							58.6 Acres	

1 in 5 yr. Winter Numbers - Using NRCS AWMFH 651.1000

*November through April weather data

Climatic Data Station	SHOSHONE
1 in 5 yr. precipitation	8.32 inches
Evaporation	2.1 inches
Net Precipitation	6.22 inches
25 yr. 24 hr. Storm	2 inches

IDAWM Values

Runoff amount	180 day storage	
	1 in 5 yr Winter	25 yr 24 hr Storm
Roofs	0	0 ft3
Concrete	0	0 ft3
Earthen Site	301974	247524 ft3
Subtotal	301974	247524 ft3
Total Runoff To Contain		549498 ft3

Waste Water Storage

Runoff 1 in 5 yr winter	301,974 ft3	2,258,769 gallons
Runoff 25 yr 24 hr storm	247,524 ft3	1,851,477 gallons
Precipitation on Lagoons	47,220 ft3	353,207 gallons
Commercial Water	- ft3	- gallons
Manure	- ft3	- gallons
Sludge	- ft3	- gallons
Required Storage for 180 days	596,718 ft3	4,463,453 gallons
Total Slurry Pond Volume	- ft3	- gallons
Available Storage	627,149 ft3	
Total Days of Aval. Storage	189 days	30,431 ft3 Surplus Storage

Pond Dimensions



Pond Size	Andys Pond 1	Andys Pond 2	0	0	0	
	(ft)	(ft)	(ft)	(ft)	(ft)	
Width Side Slope	2.3	2	0	0	0	
Bottom Width	174	318	0	0	0	
Length Side Slope	2.3	2	0	0	0	
Bottom Length	67.21	180	0	0	0	
Total Depth	13	14	0	0	0	
Free Board	1	1	0	0	0	
Lagoon Precip ft3	8011	39209	0	0	0	
LW	62.61	176	0	0	0	Total Capacity
LL	169.4	314	0	0	0	627,149 ft3
LD	12	13	0	0	0	4,691,077 gallons
Top length	114.2	262	0	0	0	
Top Width	7.41	124	0	0	0	Subtotal Capacity
Storage Volume IWMG ft3	62,620	564,529	-	-	-	627,149 ft3
Storage Volume IWMG Gal	468,398	4,222,679	-	-	-	4,691,077 gallons
excavated volume (yd3)	2,589	22,856	-	-	-	25,445

Pond Size	0	0	0	0	0	
	(ft)	(ft)	(ft)	(ft)	(ft)	
Width Side Slope	0	0	0	0	0	
Bottom Width	0	0	0	0	0	
Length Side Slope	0	0	0	0	0	
Bottom Length	0	0	0	0	0	
Total Depth	0	0	0	0	0	
Free Board	0	0	0	0	0	
Lagoon Precip ft3	0	0	0	0	0	
LW	0	0	0	0	0	
LL	0	0	0	0	0	
LD	0	0	0	0	0	Sub Total Capacity
Top length	0	0	0	0	0	
Top Width	0	0	0	0	0	
Storage Volume IWMG ft3	-	-	-	-	-	- ft3
Storage Volume IWMG Gal	-	-	-	-	-	- gallons
excavated volume (yd3)	-	-	-	-	-	-

Pond Size	0	0	0	0	0	
	(ft)	(ft)	(ft)	(ft)	(ft)	
Width Side Slope	0	0	0	0	0	
Bottom Width	0	0	0	0	0	
Length Side Slope	0	0	0	0	0	
Bottom Length	0	0	0	0	0	
Total Depth	0	0	0	0	0	
Free Board	0	0	0	0	0	
Lagoon Precip ft3	0	0	0	0	0	
LW	0	0	0	0	0	
LL	0	0	0	0	0	
LD	0	0	0	0	0	Sub Total Capacity
Top length	0	0	0	0	0	
Top Width	0	0	0	0	0	
Storage Volume IWMG ft3	-	-	-	-	-	0 ft3
Storage Volume IWMG Gal	-	-	-	-	-	- gallons
excavated volume (yd3)	-	-	-	-	-	-

AGTEC Lagoon Design



Producer Information		Facility Info
Name:	Fitzgerald Brothers	Four Brothers Dairy
Address:	0	0
City:	Shoshone	Shoshone
State:	0	0
Zip Code:	0	0
County:	Lincoln	Lincoln
Project Description:	EMP Design for the Process water and area of runoff for Barn 3.	

Animal Breakdown

Animal Type	# of Animals	Animal Weight (lbs)	Lincoln County LCO #'s	% Total Manure to Lagoon	Total Manure % to Slurry Pond	
Lactating cow	14	3000	1300	0.0	8%	0%
none	0	0	0.0	0%	0%	
none	0	0	0.0	0%	0%	
none	0	0	0.0	0%	0%	
none	0	0	0.0	0%	0%	
none	0	0	0.0	0%	0%	
none	0	0	0.0	0%	0%	
none	0	0	0.0	0%	0%	
none	0	0	0.0	0%	0%	
3000	animals	0.0	au's			

Wash Water Estimates

	Barn 3	0	0	
# Cows milked	3000	0	0	
Stantions/side	40	0	0	
Strings/milking	75.0	0.0	0.0	
Milkings per Day	2.7	0	0	milkings/day
Cow Prep.	8100	0	0	gal/day 2.7 milkings/day 1 gal/cow/milking
Bulk Tank	1800	0	0	gal/day
Pipelines	1620	0	0	gal/day 4 cycles/wash 150 gallons/cycle
Claw Backflush	0	0	0	gal/day 0 gal/cycle 0 cycles/wash
Parlor Hand Washdown	2430	0	0	gal/day 30 gal/min 30 min/milking
Deck Sprays	0	0	0	gal/day 0 gal/min 0 runtime sec 203 cycles/day
Deck Flush	0	0	0	gal/day 0 gal/min 0 min/cycle 0 cycles/day
Holding Pen Flush	0	0	0	gal/day 0 gal/min 0 min/cycle 0 cycles/day
Holding Pen Hand Washdown	2430	0	0	gal/day 30 gal/min 30 min/milking
Sprinkler Pen Water Use	0	0	0	gal/day 0 heads 0 gpm/head 0 min/pen 0 % use
Milk Room Cleaning	500	0	0	gal/day
Water Trough Cleaning	2219	0	0	gal/day 45 # of troughs 750 gal/trough 2 #/month
Miscellaneous	0	0	0	gal/day
	19,099	-	-	Total Parlor gal/day
	459,606	-	-	180 Day Volume ft3
Manure from Parlor		563	ft3/day	
Storage period		180	days	Slurry Days of Storage 0
Total Manure from Parlor to Lagoon		205,313	ft3	Slurry Pond Volume ft3 -
Years between Solid sludge Cleanout		5	years	Volume Gal -
Sludge Volume		246,375	ft3	1,842,885 Gallons



Recyclable Water Use

	Barn 3	0	0
Milking Parlor Throughput	360	270	0 Cows/hr
Time Milking Per Day	22.5	0.0	0 hours/day
Plate Cooler Water Use	56700	0	0 Gal/day
Water Cooled Compressor	0	0	0 Gal/day
Water Cooled Vacuum Pump	0	0	0 Gal/day
	56700	0	0 Total Cooling Parlor Volume/day in gallons

Water Use Evaluation

Clean Water Use	56,700 Gal/day
Cow Drinking water use	119,606 Gal/day
Commercial Parlor Use	19,099 Gal/day
Net Excess Cooling Water	0 Gal/day
Yearly Parlor Cooling Volume (amount exceeding that recycled)	0.0 Acre Ft/year

Water Use Totals

Water Use estimates are based on of milk production

Stock water Requirement	134.0 Acre Ft/yr
Commercial Parlor Use	21.4 Acre Ft/yr
Additional Cooling Use	0.0 Acre Ft/yr
Water Use Estimate	155.4 Acre Ft/yr

Total Diversion Rate

0.24 Cubic Feet/Second (CFS)

106 GPM

(this diversion rate is the minimum rate required to pump the above water use estimate 24/7/365)

Lagoon and Waste System Sizing Program



Facility Runoff Calculation

Runoff Areas

	CN #	CN#	Dimensions			
	1 in 5 yr win.	25 yr. 24 hr	Width	Length	#	Square Footage
Roofed Area	Monthly	storm				
	0	100	0	0	0	0
	0	100	0	0	0	0
	0	100	0	0	0	0
Concrete & Asphalt						
	0	100	0	0	0	0
	0	100	0	0	0	0
	0	100	0	0	0	0
	0	100	0	0	0	0
					Sub Total	0
Earthen Site						
Acres <3% Slope	80.3	91	142	*43560	6185520	< than 3% slope
Acres >3% Slope	86.9	100	0	*43560	0	> than 3% slope
Square Ft <3% Slope			0			
Square Ft >3% Slope			0			
Net Entire Site					6185520 ft^2	142.0 Acres

1 in 5 yr. Winter Numbers - Using NRCS AWMFH 651.1000

*November through April weather data

Climatic Data Station	SHOSHONE
1 in 5 yr. precipitation	8.32 inches
Evaporation	2.1 inches
Net Precipitation	6.22 inches
25 yr. 24 hr. Storm	2 inches

IDAWM Values

	180 day storage	
Runoff amount	1 in 5 yr Winter	25 yr 24 hr Storm
Roofs	0	0 ft3
Concrete	0	0 ft3
Earthen Site	731747	599802 ft3
Subtotal	731747	599802 ft3
Total Runoff To Contain		1331549 ft3

Waste Water Storage

Runoff 1 in 5 yr winter	731,747 ft3	5,473,468 gallons
Runoff 25 yr 24 hr storm	599,802 ft3	4,486,515 gallons
Precipitation on Lagoons	444,448 ft3	3,324,470 gallons
Commercial Water	459,606 ft3	3,437,852 gallons
Manure	205,313 ft3	1,535,738 gallons
Sludge	246,375 ft3	1,842,885 gallons
Required Storage for 180 days	2,687,290 ft3	20,100,928 gallons
Total Slurry Pond Volume	- ft3	- gallons
Available Storage	2,653,280 ft3	
Total Days of Aval. Storage	178 days	-34,010 ft3 Surplus Storage

Excess process water from the Barn 3 Area is allowed to flow to the Barn 2 system. The Barn 2 system has excess capacity to store this additional water.

Pond Dimensions



Pond Size	B3 Pond 1	B3 Pond 2	B3 Pond 3	B3 Pond 4	B3 Old Flush	
	(ft)	(ft)	(ft)	(ft)	(ft)	
Width Side Slope	3	2	2	2	2	
Bottom Width	512	361	335	682	222	
Length Side Slope	3	2	2	2	2	
Bottom Length	172	172	169	335	120	
Total Depth	4	8	5	7.15	5	
Free Board	1	1	1	2	1	
Lagoon Precip ft3	60324	42533	38781	156502	18248	
LW	166	168	165	327	116	Total Capacity
LL	506	357	331	674	218	2,653,280 ft3
LD	3	7	4	5.15	4	19,846,536 gallons
Top length	488	329	315	653.4	202	
Top Width	148	140	149	306.4	100	Subtotal Capacity
Storage Volume IWMG ft3	234,168	370,211	202,929	1,082,680	90,805	1,980,794 ft3
Storage Volume IWMG Gal	1,751,577	2,769,181	1,517,911	8,098,447	679,224	14,816,340 gallons
excavated volume (yd3)	11,852	15,947	9,569	56,705	4,318.52	98,392

Pond Size	B3 Compost Pond	Pen 20 Pond	0	0	0	
	(ft)	(ft)	(ft)	(ft)	(ft)	
Width Side Slope	3	2	0	0	0	
Bottom Width	449.1	340	0	0	0	
Length Side Slope	3	2	0	0	0	
Bottom Length	280	180	0	0	0	
Total Depth	5	5	0	0	0	
Free Board	1	1	0	0	0	
Lagoon Precip ft3	86137	41922	0	0	0	
LW	274	176	0	0	0	
LL	443.1	336	0	0	0	
LD	4	4	0	0	0	Sub Total Capacity
Top length	419.1	320	0	0	0	
Top Width	250	160	0	0	0	
Storage Volume IWMG ft3	451,985	220,501	-	-	-	672,486 ft3
Storage Volume IWMG Gal	3,380,846	1,649,350	-	-	-	5,030,196 gallons
excavated volume (yd3)	21,303	10,389	-	-	-	31,692

Pond Size	0	0	0	0	0	
	(ft)	(ft)	(ft)	(ft)	(ft)	
Width Side Slope	0	0	0	0	0	
Bottom Width	0	0	0	0	0	
Length Side Slope	0	0	0	0	0	
Bottom Length	0	0	0	0	0	
Total Depth	0	0	0	0	0	
Free Board	0	0	0	0	0	
Lagoon Precip ft3	0	0	0	0	0	
LW	0	0	0	0	0	
LL	0	0	0	0	0	
LD	0	0	0	0	0	Sub Total Capacity
Top length	0	0	0	0	0	
Top Width	0	0	0	0	0	
Storage Volume IWMG ft3	-	-	-	-	-	0 ft3
Storage Volume IWMG Gal	-	-	-	-	-	- gallons
excavated volume (yd3)	-	-	-	-	-	-

AGTEC Lagoon Design



Producer Information		Facility Info	
Name:	Fitzgerald Brothers	Four Brothers Dairy	
Address:	0	0	
City:	Shoshone	Shoshone	
State:	0	0	
Zip Code:	0	0	
County:	Lincoln	Lincoln	
Project Description: EMP Design for the Process water and area of runoff for Barn 2.			

Animal Breakdown

Animal Type	# of Animals	Animal Weight (lbs)	Lincoln County LCO #'s	% Total Manure to Lagoon	Total Manure % to Slurry Pond	
Lactating cow	14	1200	1300	0.0	8%	0%
none	0	0	0.0	0%	0%	0%
none	0	0	0.0	0%	0%	0%
none	0	0	0.0	0%	0%	0%
none	0	0	0.0	0%	0%	0%
none	0	0	0.0	0%	0%	0%
none	0	0	0.0	0%	0%	0%
none	0	0	0.0	0%	0%	0%
none	0	0	0.0	0%	0%	0%
none	0	0	0.0	0%	0%	0%
	1200	animals	0.0	au's		

Wash Water Estimates

	Barn 2	0	0	
# Cows milked	1200	0	0	
Stantions/side	16	0	0	
Strings/milking	75.0	0.0	0.0	
Milkings per Day	3	0	0	milkings/day
Cow Prep.	720	0	0	gal/day
Bulk Tank	1100	0	0	gal/day
Pipelines	1200	0	0	gal/day
Claw Backflush	0	0	0	gal/day
Parlor Hand Washdown	1800	0	0	gal/day
Deck Sprays	0	0	0	gal/day
Deck Flush	0	0	0	gal/day
Holding Pen Flush	0	0	0	gal/day
Holding Pen Hand Washdown	1800	0	0	gal/day
Sprinkler Pen Water Use	0	0	0	gal/day
Milk Room Cleaning	300	0	0	gal/day
Water Trough Cleaning	986	0	0	gal/day
Miscellaneous	0	0	0	gal/day
	7,906	-	-	Total Parlor gal/day
	190,259	-	-	180 Day Volume ft3
Manure from Parlor		225	ft3/day	
Storage period		180	days	
Total Manure from Parlor to Lagoon		82,125	ft3	
Years between Solid sludge Cleanout		5	years	
Sludge Volume		98,550	ft3	
				737,154 Gallons



Recyclable Water Use

	Barn 2	0	0
Milking Parlor Throughput	144	270	0 Cows/hr
Time Milking Per Day	20.0	0.0	0 hours/day
Plate Cooler Water Use	50400	0	0 Gal/day
Water Cooled Compressor	0	0	0 Gal/day
Water Cooled Vacuum Pump	0	0	0 Gal/day
	50400	0	0 Total Cooling Parlor Volume/day in gallons

Water Use Evaluation

Clean Water Use	50,400 Gal/day
Cow Drinking water use	47,843 Gal/day
Commercial Parlor Use	7,906 Gal/day
Net Excess Cooling Water	0 Gal/day
Yearly Parlor Cooling Volume (amount exceeding that recycled)	0.0 Acre Ft/year

Water Use Totals

Water Use estimates are based on of milk production

Stock water Requirement	53.6 Acre Ft/yr
Commercial Parlor Use	8.9 Acre Ft/yr
Additional Cooling Use	0.0 Acre Ft/yr
Water Use Estimate	62.4 Acre Ft/yr

Total Diversion Rate

0.09 Cubic Feet/Second (CFS)

43 GPM

(this diversion rate is the minimum rate required to pump the above water use estimate 24/7/365)

Lagoon and Waste System Sizing Program



Facility Runoff Calculation

Runoff Areas

	CN #	CN#	Dimensions			
	1 in 5 yr win.	25 yr. 24 hr	Width	Length	#	Square Footage
Roofed Area	Monthly	storm				
	0	100	0	0	0	0
	0	100	0	0	0	0
Concrete & Asphalt	0	100	0	0	0	0
	0	100	0	0	0	0
	0	100	0	0	0	0
Earthen Site	0	100	0	0	0	0
	0	100	0	0	0	0
	0	100	0	0	0	0
					Sub Total	0
Acres <3% Slope		80.3	91	64 *43560	2787840 < than 3% slope	
Acres >3% Slope		86.9	100	0 *43560	0 > than 3% slope	
Square Ft <3% Slope				0		
Square Ft >3% Slope				0		
Net Entire Site					2787840 ft^2	
					64.0 Acres	

1 in 5 yr. Winter Numbers - Using NRCS AWMFH 651.1000

*November through April weather data

Climatic Data Station	SHOSHONE
1 in 5 yr. precipitation	8.32 inches
Evaporation	2.1 inches
Net Precipitation	6.22 inches
25 yr. 24 hr. Storm	2 inches

IDAWM Values

	180 day storage	
Runoff amount	1 in 5 yr Winter	25 yr 24 hr Storm
Roofs	0	0 ft3
Concrete	0	0 ft3
Earthen Site	329801	270333 ft3
Subtotal	329801	270333 ft3
Total Runoff To Contain		600135 ft3

Process Water from Barn 3
34,010 ft3

Waste Water Storage

Runoff 1 in 5 yr winter	329,801 ft3	2,466,915 gallons	Barn 2 storage accepts excess process water from Barn 3 and is connected via pipeline to the heifer raising area.
Runoff 25 yr 24 hr storm	270,333 ft3	2,022,091 gallons	
Precipitation on Lagoons	385,464 ft3	2,883,273 gallons	
Commercial Water	190,259 ft3	1,423,134 gallons	
Manure	82,125 ft3	614,295 gallons	
Sludge	98,550 ft3	737,154 gallons	
Required Storage for 180 days	1,356,532 ft3	10,146,862 gallons	
Total Slurry Pond Volume	- ft3	- gallons	
Available Storage	2,456,779 ft3		
Total Days of Aval. Storage	326 days		
		1,100,247 ft3 Surplus Storage	1,066,237 Net Excess

Pond Dimensions



Pond Size	B2 Settling (ft)	B2 Lagoon 1 (ft)	B2 Lagoon 2 (ft)	B2 East 1 (ft)	B2 East 2 (ft)	
Width Side Slope	3	2	2	3	3	
Bottom Width	200	420	290	391.8	396.265	
Length Side Slope	3	2	2	3	3	
Bottom Length	100	200	175	370	286	
Total Depth	4.33	8.5	6.5	6.5	7.1	
Free Board	1	1	1	1	1	
Lagoon Precip ft3	13700	57540	34764	99302	77632	
LW	94	196	171	364	280	Total Capacity
LL	194	416	286	385.8	390.265	2,456,779 ft3
LD	3.33	7.5	5.5	5.5	6.1	18,376,708 gallons
Top length	174.02	386	264	352.8	353.665	
Top Width	74.02	166	149	331	243.4	Subtotal Capacity
Storage Volume IWMG ft3	51,588	544,920	242,222	706,324	594,475	2,139,528 ft3
Storage Volume IWMG Gal	385,880	4,076,002	1,811,819	5,283,302	4,446,671	16,003,673 gallons
excavated volume (yd3)	2,610	23,217	10,803	31,415	26,099.92	94,144

Pond Size	B2 East 3 (ft)	B2 East 4 (ft)	Commod Collec (ft)	0 (ft)	0 (ft)	
Width Side Slope	3	2	3	0	0	
Bottom Width	310.47	332.9	700	0	0	
Length Side Slope	3	2	3	0	0	
Bottom Length	224	165	36	0	0	
Total Depth	4.5	2.5	2.5	0	0	
Free Board	1	1	1	0	0	
Lagoon Precip ft3	47639	37626	17262	0	0	
LW	218	161	30	0	0	
LL	304.47	328.9	694	0	0	
LD	3.5	1.5	1.5	0	0	Sub Total Capacity
Top length	283.47	322.9	685	0	0	
Top Width	197	155	21	0	0	
Storage Volume IWMG ft3	213,624	77,243	26,384	-	-	317,251 ft3
Storage Volume IWMG Gal	1,597,910	577,776	197,349	-	-	2,373,035 gallons
excavated volume (yd3)	10,419	4,858	1,827	-	-	17,104

Pond Size	0 (ft)	0 (ft)	0 (ft)	0 (ft)	0 (ft)	
Width Side Slope	0	0	0	0	0	
Bottom Width	0	0	0	0	0	
Length Side Slope	0	0	0	0	0	
Bottom Length	0	0	0	0	0	
Total Depth	0	0	0	0	0	
Free Board	0	0	0	0	0	
Lagoon Precip ft3	0	0	0	0	0	
LW	0	0	0	0	0	
LL	0	0	0	0	0	
LD	0	0	0	0	0	Sub Total Capacity
Top length	0	0	0	0	0	
Top Width	0	0	0	0	0	
Storage Volume IWMG ft3	-	-	-	-	-	0 ft3
Storage Volume IWMG Gal	-	-	-	-	-	- gallons
excavated volume (yd3)	-	-	-	-	-	-

AGTEC Lagoon Design



Producer Information		Facility Info
Name:	Fitzgerald Brothers	Four Brothers Dairy
Address:	0	0
City:	Shoshone	Shoshone
State:	0	0
Zip Code:	0	0
County:	Lincoln	Lincoln
Project Description:	EMP Design for the Process water and area of runoff for Barns 4 & 5.	

Animal Breakdown

Animal Type	# of Animals	Animal Weight (lbs)	Lincoln County LCO #'s	% Total Manure to Lagoon	Total Manure % to Slurry Pond
Lactating cow 14	3500	1300	0.0	8%	0%
Lactating cow 14	2200	1300	0.0	8%	0%
Dry Cow 10	1200	1300	0.0	0%	0%
none	0	0	0.0	0%	0%
Heifer 10	800	850	640.0	0%	0%
none	0	0	0.0	0%	0%
none	0	0	0.0	0%	0%
none	0	0	0.0	0%	0%
none	0	0	0.0	0%	0%
	7700	animals	640.0	au's	

Wash Water Estimates

	Barn 4	Barn 5	0	
# Cows milked	3500	2200	0	
Stantions/side	40	30	0	
Strings/milking	87.5	73.3	0.0	
Milkings per Day	2.3	2.8	0	milkings/day
Cow Prep.	8050	6160	0	gal/day 2.3 milkings/day 1 gal/cow/milking
Bulk Tank	2250	1100	0	gal/day
Pipelines	1380	1400	0	gal/day 4 cycles/wash 150 gallons/cycle
Claw Backflush	0	0	0	gal/day 0 gal/cycle 0 cycles/wash
Parlor Hand Washdown	1380	1680	0	gal/day 30 gal/min 20 min/milking
Deck Sprays	0	0	0	gal/day 0 gal/min 0 runtime sec 201 cycles/day
Deck Flush	0	0	0	gal/day 0 gal/min 0 min/cycle 0 cycles/day
Holding Pen Flush	0	0	0	gal/day 0 gal/min 0 min/cycle 0 cycles/day
Holding Pen Hand Washdown	1380	1680	0	gal/day 30 gal/min 20 min/milking
Sprinkler Pen Water Use	0	0	0	gal/day 0 heads 0 gpm/head 0 min/pen 0 % use
Milk Room Cleaning	300	300	0	gal/day
Water Trough Cleaning	1479	1479	0	gal/day 30 # of troughs 750 gal/trough 2 #/month
Miscellaneous	300	0	0	gal/day
	16,519	13,799	-	Total Parlor gal/day
	397,527	332,072	-	180 Day Volume ft3
Manure from Parlor		1069	ft3/day	
Storage period		180	days	Slurry Days of Storage 0
Total Manure from Parlor to Lagoon		390,094	ft3	Slurry Pond Volume ft3 -
Years between Solid sludge Cleanout		5	years	Volume Gal -
Sludge Volume		468,113	ft3	3,501,482 Gallons



Recyclable Water Use

	Barn 4	Barn 5	0
Milking Parlor Throughput	360	270	0 Cows/hr
Time Milking Per Day	22.4	22.8	0 hours/day
Plate Cooler Water Use	53667	47911	0 Gal/day
Water Cooled Compressor	0	0	0 Gal/day
Water Cooled Vacuum Pump	0	0	0 Gal/day
	53667	47911	0 Total Cooling Parlor Volume/day in gallons

Water Use Evaluation

Clean Water Use	101,578 Gal/day
Cow Drinking water use	216,831 Gal/day
Commercial Parlor Use	30,319 Gal/day
Net Excess Cooling Water	0 Gal/day
Yearly Parlor Cooling Volume (amount exceeding that recycled)	0.0 Acre Ft/year

Water Use Totals

Water Use estimates are based on of milk production

Stock water Requirement	242.9 Acre Ft/yr
Commercial Parlor Use	34.0 Acre Ft/yr
Additional Cooling Use	0.0 Acre Ft/yr
Water Use Estimate	276.8 Acre Ft/yr

Total Diversion Rate

0.42 Cubic Feet/Second (CFS)

189 GPM

(this diversion rate is the minimum rate required to pump the above water use estimate 24/7/365)

Lagoon and Waste System Sizing Program



Facility Runoff Calculation

Runoff Areas

	CN #	CN#	Dimensions		#	Square Footage
	1 in 5 yr win.	25 yr. 24 hr	Width	Length		
Roofed Area	Monthly	storm				
	0	100	0	0	0	0
	0	100	0	0	0	0
	0	100	0	0	0	0
Concrete & Asphalt						0
	0	100	0	0	0	0
	0	100	0	0	0	0
	0	100	0	0	0	0
	0	100	0	0	0	0
					Sub Total	0
Earthen Site						
Acres <3% Slope	80.3	91	352	*43560	15333120	< than 3% slope
Acres >3% Slope	86.9	100	0	*43560	0	> than 3% slope
Square Ft <3% Slope			0			
Square Ft >3% Slope			0			
Net Entire Site					15333120 ft^2	352.0 Acres

1 in 5 yr. Winter Numbers - Using NRCS AWMFH 651.1000

*November through April weather data

Climatic Data Station	SHOSHONE
1 in 5 yr. precipitation	8.32 inches
Evaporation	2.1 inches
Net Precipitation	6.22 inches
25 yr. 24 hr. Storm	2 inches

IDAWM Values

Runoff amount	180 day storage	25 yr 24 hr Storm
	1 in 5 yr Winter	
Roofs	0	0 ft3
Concrete	0	0 ft3
Earthen Site	1813908	1486832 ft3
Subtotal	1813908	1486832 ft3
Total Runoff To Contain		3300740 ft3

Waste Water Storage

Runoff 1 in 5 yr winter	1,813,908 ft3	13,568,033 gallons
Runoff 25 yr 24 hr storm	1,486,832 ft3	11,121,503 gallons
Precipitation on Lagoons	1,382,075 ft3	10,337,918 gallons
Commercial Water	729,599 ft3	5,457,403 gallons
Manure	390,094 ft3	2,917,901 gallons
Sludge	468,113 ft3	3,501,482 gallons
Required Storage for 180 days	6,270,620 ft3	46,904,239 gallons
Total Slurry Pond Volume	- ft3	- gallons
Available Storage	8,981,681 ft3	
Total Days of Aval. Storage	258 days	

Pond Dimensions



Pond Size	B4ESC (ft)	B4WSC (ft)	B5NSC (ft)	B5SSC (ft)	B4 Pond 1 (ft)
Width Side Slope	2	2	2	2.5	3
Bottom Width	316	282	225	475	677
Length Side Slope	2	2	2	2.5	3
Bottom Length	64	56	95	84	280
Total Depth	4	4	4	9	7
Free Board	1	1	1	1	1
Lagoon Precip ft3	13853	10818	14642	27332	129849
LW	60	52	91	79	274
LL	312	278	221	470	671
LD	3	3	3	8	6
Top length	300	266	209	430	635
Top Width	48	40	79	39	238
Storage Volume IWMG ft3	49,608	37,572	54,861	213,467	1,003,656
Storage Volume IWMG Gal	371,068	281,039	410,360	1,596,731	7,507,347
excavated volume (yd3)	2,555	1,948	2,797	9,276	44,049.19
					Total Capacity
					8,981,681 ft3
					67,182,976 gallons
					Subtotal Capacity
					1,359,164 ft3
					10,166,544 gallons
					60,626

Pond Size	B4 Pond 2 (ft)	B4 Pond 3 (ft)	B4 Pond 4 (ft)	Pen 40-1 (ft)	Pen 40-2 (ft)
Width Side Slope	3	3	2	3	3
Bottom Width	920	780	477	353.4	254
Length Side Slope	3	3	3	3	3
Bottom Length	400	331	424	300	215
Total Depth	3	8	8	5	6
Free Board	1	1	2	1	1
Lagoon Precip ft3	252080	176853	138540	72624	37408
LW	394	325	412	294	209
LL	914	774	469	347.4	248
LD	2	7	6	4	5
Top length	902	732	445	323.4	218
Top Width	382	283	376	270	179
Storage Volume IWMG ft3	704,632	1,603,413	1,066,812	378,523	226,385
Storage Volume IWMG Gal	5,270,647	11,993,529	7,979,754	2,831,354	1,693,360
excavated volume (yd3)	39,578	68,768	54,637	17,860	10,331.56
					Sub Total Capacity
					3,979,765 ft3
					29,768,644 gallons
					191,174

Pond Size	Pen 40-3 (ft)	Pen 36 (ft)	B4 Compost (ft)	Pantone (ft)	Buckway (ft)	Heifer ROP (ft)
Width Side Slope	3	3.5	3	3	3	3
Bottom Width	416	479.48	723.2	400.07	393.12	251
Length Side Slope	3	3.5	3	3	3	3
Bottom Length	208	174	500	260	270	240
Total Depth	6	6.5	5	6	11	6
Free Board	1	1	1	1	1	1
Lagoon Precip ft3	59272	57149	247696	71252	72708	41264
LW	202	167	494	254	264	234
LL	410	472.48	717.2	394.07	387.12	245
LD	5	5.5	4	5	10	5
Top length	380	433.98	693.2	364.07	327.12	215
Top Width	172	128.5	470	224	204	204
Storage Volume IWMG ft3	369,700	368,985	1,359,818	453,364	838,661	252,225
Storage Volume IWMG Gal	2,765,356	2,760,011	10,171,436	3,391,160	6,273,183	1,886,643
excavated volume (yd3)	16,804	16,630	63,607	20,547	34,771.59	11,494.67
						Sub Total Capacity
						3,642,752 ft3
						27,247,788 gallons

Appendix C - Crop Specific Guidelines

Alfalfa, Hay, S

UNIVERSITY OF IDAHO INFORMATION

SOIL SAMPLING

Environmental concerns have brought nutrient management in agriculture under increased scrutiny. A goal of sound nutrient management is to maximize the proportion of applied nutrients that is used by the crop (nutrient use efficiency). Soil sampling is a best management practice (BMP) for fertilizer management that will help improve nutrient use efficiency and protect the environment.

SOIL SAMPLING is also one of the most important steps in a sound crop fertilization program. Poor soil sampling procedures account for more than 90 percent of all errors in fertilizer recommendations based on soil tests. Soil test results are only as good as the soil sample. Once you take a good sample, you must also handle it properly for it to remain a good sample. A good soil testing program can be divided into four operations: (1) taking the sample, (2) analyzing the sample, (3) interpreting the sample analyses, and (4) making the fertilizer recommendations.

GOOD SOIL SAMPLING starts with recognizing the soil fertility varies among and within fields. Soil sampling for plant nutrients should be done one to two weeks before the anticipated fertilizer application or planting date. To adequately characterize nutrient availability in a field, each soil sample submitted to a lab should consist of a composite of at least 20 individual subsamples representing the field's major soil characteristics. To determine Nitrogen availability, separate soil samples should be collected from the 0- to 12-inch depth and the 12- to 24-inch depth. All other nutrients require only a 0- to 12-inch sample. Samples should not be collected from poor production areas or wet spots unless specific recommendations are desired for those areas.

THE SUBSAMPLES should be thoroughly mixed in a clean plastic bucket, keeping the first-foot samples separate from the second-foot samples. About one pound of soil from each depth's composite sample should then be placed in a separate plastic-lined sampling bag. All requested information including grower's name, field identification, date, and previous crop should be provided with the sample. Soil samples should not be stored under warm conditions because microbial activity can change the extractable nitrate (NO₃-N) and (NH₄-N) concentrations. Accordingly, soil samples should be submitted to a local soil testing lab as quickly as possible to provide for accurate soil testing results. IF SIZABLE AREAS OF THE FIELD DIFFER in productivity or visual appearance, crop yield and quality the field may benefit from variable-rate fertilization. Current site-specific soil sampling and fertilizer application technologies provide useful options for providing optimal nutrient availability throughout the field. Information on soil nutrient mapping and variable-rate fertilization can be obtained by contacting an extension soil fertility specialist, your local county ag extension educator, crop advisor, or ag consultant. For more detailed information about soil sampling, refer to EXT 704, (Soil Sampling).

FERTILIZER GUIDE

Nutrient requirements for alfalfa are relatively high compared to many other crops commonly grown in Idaho. Each ton of alfalfa hay removes about 60 lb nitrogen (N) per acre, 50 lb potassium (K) per acre, 30 lb calcium (Ca) per acre, 8 lb phosphorus (P) per acre, and about 6 lb per acre of both sulfur (S) and magnesium (Mg). Requirements for phosphorus and potassium fertilizers are much higher than for S, manganese (Mn), zinc (Zn), iron (Fe), and boron (B).

NITROGEN (N)

Essentially all nitrogen required by established alfalfa is provided by the symbiotic relationship with N-fixing *Rhizobium* bacteria and N mineralized from soil organic matter. Top dressed N usually does not improve yield, quality, or vigor of established stands. However, applications of 20 to 40 lb N per acre may be helpful during stand establishment prior to nodulation of the roots. Applied N would most likely be needed following small grain production in which the residue is returned to the soil. Application of larger amounts may inhibit nodulation, decrease symbiotic N fixation, and encourage grass weeds, thereby reducing alfalfa growth or quality when harvested. Alfalfa receiving appreciable amounts of animal manures, dairy effluent, or other organic N sources will also have reduced N fixation. The probability of an N response is usually greatest on coarse-textured soils with low organic matter content. Nitrogen fertilizer may be required for maximum alfalfa production and quality if the roots are poorly nodulated. Poor nodulation as well as poor *Rhizobial* activity and N-fixing capacity can result from a number of factors, including lack of proper seed inoculation at planting, diseases, insects, water deficits, nutrient deficiencies or toxicities, or other soil physical or chemical conditions that reduce the effectiveness of the *Rhizobium* inoculant. Poor inoculation results from not using inoculant, using inoculant that has lost its viability (expired shelf life), or using *Rhizobium* inoculant strains that are not effective. Poor inoculation, nodulation, or *Rhizobial* effectiveness is indicated when alfalfa protein is low (less than 18%) when cut at the early bloom stage. Healthy *Rhizobium* nodules should be pink when cut open if they are effectively fixing atmospheric N. If nodulation or *Rhizobial* effectiveness is limited by pests, water deficits, or soil conditions such as salinity, sodicity, nutrient deficiencies, or soil compaction, then attempts should be made to correct the problem through appropriate management practices. For more information on proper inoculation of alfalfa, refer to CIS 838, (Inoculation of Legumes in Idaho). Alfalfa is sometimes used to scavenge nutrients from soils receiving excessive animal manure or other biological waste applications. An alfalfa crop yielding 6 tons per acre can remove up to 360 lb of N per acre. However, excessive nitrogen uptake can increase the forage nitrate toxicity hazard for dairy and beef cattle. In addition, animal manure applications can promote grass and weed growth, which in turn can also increase the potential for nitrate toxicity if the population of the noxious weed *Kochia* increases.

Producers sometimes plant a companion crop when establishing alfalfa in order to increase the productivity of the first cutting. However, this practice is not recommended because the alfalfa stand typically is reduced by competition from the companion crop. If growers plant alfalfa with a companion crop, both crops compete for the available N. Under these conditions, N rates of 30 to 40 lb per acre are suggested if available soil N does not exceed 60 to 80 lb per acre.

PHOSPHORUS (P)

Adequate phosphorus availability is important for maintaining plant health, winter hardiness, and optimum root, stem, and leaf growth. Since phosphorus is relatively immobile in soil, P fertilizer should be incorporated into the soil prior to planting to raise soil P concentrations to optimum levels for early plant growth. The phosphorus recommendations presented are based on the soil test P concentration and free lime content in the top foot of soil, and the yield potential. Significant amounts of free lime in the soil will make less phosphorus available to plants as it precipitates soil solution P. Top dressed P applications can also be effective but should be made

following harvest in the fall or in the spring before regrowth in order to maximize soil contact. Knifing ammonium polyphosphate (10-34-0) into the soil or applying surface bands in the fall or spring are also effective P fertilization methods for alfalfa. As the stand ages and plant density decreases, the ability of the alfalfa root system to take up P diminishes due to decreased soil P concentrations and root activity. Under these conditions, smaller P rates applied more frequently may increase P uptake efficiency. Effective sources of P for alfalfa include monoammonium phosphate (11-52-0), triple superphosphate (0-45-0), ammonium polyphosphate (10-34-0), and phosphoric acid. Fertilizer P can be broadcast as 11-52-0 or applied through the irrigation system as 10-34-0 with equal effectiveness. Phosphorus sources should be selected on the basis of cost, local availability, and equipment requirements.

POTASSIUM (K)

Alfalfa has a high potassium requirement. A crop of 8 tons per acre will remove about 480 lb of K₂O per acre. Most Idaho soils and surface irrigation waters are naturally high in K. However, K deficiencies can develop in intensively cropped fields, particularly those fields cropped to alfalfa for many years. Sandy soils are generally more prone to developing K deficiencies than silt loam or clay soils and therefore have a higher probability of responding to K fertilization. Potassium movement in soils is limited, although it is more mobile than P. Like phosphorus, potassium fertilizer recommendations are based on calibrated relationships between soil test concentrations in the top foot of soil and yield response. Soil test K should generally be in the range of 160 to 200 ppm for optimum alfalfa yield. Potassium fertilizer should also be incorporated during seedbed preparation prior to establishment, or broadcast in the fall or early spring on established stands. Potassium chloride (0-0-60), potassium sulfate (0-0-52), K-Mag, and various liquid K fertilizers are all effective K sources for alfalfa. Potassium applications exceeding 300 lb K₂O per acre should be split between fall and spring to avoid salt damage. Excessive K applications should be avoided since alfalfa will remove substantially more K than it needs for maximum yield. Excessive K concentrations in alfalfa can contribute to milk fever in dairy cattle.

SULFUR (S)

Sulfur is a key contributor to alfalfa yield and quality. Sulfur requirements for alfalfa vary with soil texture, leaching losses, soil test SO₄-S concentration, and S content of the irrigation water. About 30 to 40 lb of SO₄-S should be applied before planting to soils containing less than 10ppm SO₄-S in the top foot of soil. This amount should provide adequate soil S for several years, provided the SO₄-S is not leached from the rooting depth. The SO₄-S form is mobile and can be leached to lower soil profile depths. For established alfalfa, sampling to a depth of two feet will provide a more accurate indication of S availability to alfalfa roots beyond the first foot. Areas irrigated with water from the Snake River or streams fed by return flow should have adequate S for alfalfa production. High rainfall areas, mountain valleys, and foothills are more likely to have S deficiencies, particularly on coarse-textured soils with low organic matter content. Sulfur fertilizer sources should be carefully selected because elemental S must be converted to SO₄-S by soil microorganisms before plant roots can take it up. Conversion of elemental S to SO₄-S may take several months in warm, moist soil. Consequently, elemental S fertilizers usually cannot supply adequate levels of S to alfalfa in the year that it is applied. However, elemental S fertilizers can supply considerable S during the year following application. Sulfate-sulfur sources such as gypsum (calcium sulfate), ammonium sulfate (21-0-0), or potassium sulfate (0-0-52-18) are recommended to correct S deficiencies during the year of

application.

SECONDARY NUTRIENTS AND MICRONUTRIENTS

CALCIUM (Ca) and MAGNESIUM (Mg) deficiencies in alfalfa are rare in the irrigated areas of southern Idaho. Most soils in the Snake River plain have adequate amounts of Ca and Mg for alfalfa production, although low soil Mg concentrations are sometimes encountered on very sandy soils that have been heavily fertilized with K for long periods. Under these conditions, applications of MgSO₄ or K-Mag at 20 to 40 lb of Mg per acre may provide a benefit.

Micronutrient applications should be based on recent soil test results.

BORON (B) deficiencies can usually be corrected by applying 2 to 3 lb of B per acre for the duration of the crop. However, on very sandy soils, or high rainfall areas where soils are subject to excessive leaching of B, annual applications of 1/2 to 1 lb of B per acre may be more Sulfur effective. Commonly used forms of B include boric acid, Borax, and sodium borate.

ZINC (Zn), MANGANESE (Mn), and IRON (Fe) deficiencies can be corrected by applying 5 to 10 lb per acre of the required nutrient using Zn, Mn, or Fe sulfates or other soluble forms.

MOLYBDENUM (Mo) availability is generally adequate in the alkaline soils that are prevalent in the irrigated areas of southern Idaho.

TISSUE TESTING

Plant tissue testing provides an effective means of evaluating the nutrient status of an established alfalfa stand. Samples should be collected from about 20 to 30 plants at early bloom in representative areas of the field that are free from water stress or obvious pest problems. The top six inches of the stem should be sampled and sent immediately to a soil testing lab for analysis. Sufficiency ranges for the various nutrients are presented below. Nutrient concentrations below these ranges indicate a need for supplemental fertilization. When nutrient deficiencies are identified during the growing season, the deficiencies can often be corrected by injecting water-soluble fertilizers through the sprinkler system. Liquid forms of N, P, K, S, and micronutrients are commonly available in Idaho and should be selected on the basis of cost relative to dry fertilizers and ease of application. If alfalfa is furrow irrigated, foliar sprays can be used to correct micronutrient deficiencies but avoid foliar applications of N, P, K, and S at high rates that can cause foliar burning.

Contact your County Extension Agent if you have any questions regarding the interpretation of this information or for further information on your local needs.

Corn, Field, Silage

UNIVERSITY OF IDAHO INFORMATION

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FERTILIZER GUIDE

NITROGEN (N)

Nitrogen rates depend upon some of the following factors: previous crop, past fertilizer use, soil type and leaching hazard and realistic yield goal for the grower and the area.

Adequate N is necessary for maximum economic production of irrigated field corn used for silage or grain. Fertilizer N represents by far the largest share of the fertilizer costs for field corn in Idaho. The amount of N required depends on many factors that influence total corn production and quality. These factors include length of growing season, corn hybrid, previous crop, past fertilizer use, soil type, leaching hazard and previous manuring. Estimates of both the N available to corn during the season and the yield potential of the crop should be considered when determining N fertilizer rates.

TOTAL N REQUIREMENTS BASED ON POTENTIAL YIELD - Fertilizer N rates should be used which correspond to the yield growers can reasonably expect under their soil and management conditions. The historical field corn yield obtained by a grower in a specific field or area generally provides a fair approximation of yield potential given a grower's traditional crop

management. Projected changes in crop management (i.e. improved variety, better disease and weed control) designed to appreciably increase production may require adjustment of yield potential upward. Research has shown that the available N required to produce a good field corn yield depends on a variety of crop management practices. Factors such as weed, insect and disease control as well as irrigation, planting date and soil type can influence the N required by corn for maximum yield.

AVAILABLE NITROGEN - Available N in the soil includes mineralizable N (released from organic matter during the growing season) inorganic N as nitrate (N03-N) and ammonium (NH4-N), and N credits from previous cropping or manures. Each component of available N must be estimated for accurate determination of optimum fertilizer N rates.

MINERALIZABLE NITROGEN - Soils vary in their capacity to release N from organic matter during the growing season. The amount of N released depends on such factors as soil type, soil moisture, soil temperature, previous crop, and the history of fertilizer N applied. While soil organic matter content is frequently used to estimate annual mineralizable N contributions, in southern Idaho irrigated soils organic matter does not accurately predict the amount of N that is mineralized.

INORGANIC NITROGEN - Residual soil inorganic N (N03, NH4) can be evaluated most effectively with a soil test. Soil samples should be collected in foot increments to a depth of two feet, unless roots are restricted by dense soil layers or high water tables. Ammonium is generally low in preplant soil samples and thus contributes little to available N. However, it can be as high as or higher than N03-N. NH4-N should be determined along with N03-N, especially when there is reason to expect the presence of appreciable NH4-N, such as recent ammonium N fertilizer applications. Soil samples should be collected before seeding in the spring to represent the area to be fertilized.

NITROGEN FROM PREVIOUS CROP RESIDUES - Nitrogen associated with decomposition of previous crop residues should also be considered when estimating available N. Residues that require additional N for decomposition include cereal straw and mature corn stalks. Research has shown that 15 pounds of additional N are needed per ton of straw returned to the soil, up to a maximum of 50 pounds. For more information on compensating for cereal residues, refer to CIS 825, "Wheat Straw Management and Nitrogen Fertilizer Requirements." Row crop residues (potatoes, sugarbeets, and onions) generally do not require additional N for decomposition. Consequently, these residues have little effect on the N needs of field corn. Legume residues from beans, peas, and alfalfa can release appreciable N during the following crop season that may not be reflected by the preplant soil test. This N is derived from the decomposition of both plant tops and nodulated root systems.

NITROGEN FROM MANURES - Soils in which field corn is grown occasionally receive animal manures or lagoon wastes. Nutrient contributions from these sources should also be taken into consideration when estimating available N for the next season. Manures can preclude the need for any fertilizer, depending on the rate applied and their nutrient composition. Manures can vary appreciably depending on the animal, how the manure is processed, and the kind and extent of bedding material. For the most accurate estimate of fertilizer equivalent values, the manure

should be analyzed for its nutrient content.

IRRIGATION WATER - Irrigation waters derived from deep wells are generally low in N. More shallow wells can have significant levels of nitrogen because of leaching of nitrogen from impacts from commercial fertilizer use, animal waste, and improperly functioning septic systems. Irrigation waters from most districts are also low in N when diverted from its source. Background levels of N from original sources are generally about 2 parts per million (ppm). The more return flow included in diverted water sources, the higher the N content. Return flows may include N dissolved when irrigation waters pass through fields high in residual or recently added fertilizer N as well as from soluble fertilizer N applied with the irrigation water. Most irrigation districts should know the N content of the water they divert. Contact them for this information to determine the levels of N added with your irrigation water. However, since irrigation water N levels are influenced by upstream management, if you use irrigation water that receives runoff after it is diverted, only a water test can accurately evaluate the N added with irrigation waters. For each ppm or milligrams per liter (mg/L) of N reported in the water sample, multiply by 2.7 to get the N added per acre foot of water applied. For example, if the water sample contained 10 ppm of N, 3 acre feet of water applied would be the equivalent of 81 pounds of N per acre. Typically, of the water applied with furrow irrigation only 50 percent is retained on the field and the rest runs off the end. The net retention of N applied with furrow irrigation would, therefore, be about half of the water applied or about 40 pounds per acre in this example. If more or less of the irrigation water is retained with each wetting, then growers should adjust the water N contribution accordingly. Excessive irrigation by any method reduces N availability to field corn. Additional N may be needed under these conditions. Growers should not use aqua or anhydrous N through a sprinkler irrigation system. Water running soluble N sources with a furrow irrigation system can be an effective means of adding N. Two limitations of this practice are that (1) the application of the N with this method may not be as uniform as desired and (2) runoff containing the N may contaminate downstream surface waters. Growers can minimize the loss of N by shutting off the injection unit before the irrigation water reaches the end of the furrow. This practice should not substitute for careful consideration of N needs while N can be side dressed.

CALCULATION OF N APPLICATION RATES - To calculate the fertilizer N application rate, the following equation is used: Fertilizer application rate (deficit) or Over application of Nitrogen = (Total N required producing a given yield) - (Mineralizable N) - (Inorganic N measured by the soil test) - (previous crop/residue management) - (Manure Nitrogen) - (Irrigation Water)

TIMING OF NITROGEN APPLICATION - Coarse-textured soils, including sandy loams, loamy soils and sands, may lose N from leaching. For these soils, side dress a portion of the N at the time of the last cultivation. Sprinkler irrigation of corn under center pivots provides increased flexibility for providing N during the season. With sprinklers N can be injected into the system and applied with the water. On silt loam soils, split applications of N have not proven more effective as long as preplant N is adequately incorporated. High N rates (approaching 300 pounds per acre) broadcast and incorporated before planting may reduce early season corn growth. If high N rates are needed, split applications should be considered. High plant populations (above 28,000 to 30,000) and early plantings of longer season hybrids in the Treasure Valley will respond to high N rates provided there are no other limiting factors. High N

rates will not compensate for reductions in stand or delayed plantings. High plant populations of field corn are more susceptible to N shortages because of greater competition among plants for limited N. Side dressing may cause root pruning depending on plant size, distance of shank from the row and placement depth. High N rates (above 300 pounds per acre) broadcast and incorporated before planting may reduce early season corn growth. If high N rates are needed, split applications should be considered. On sandy textured soils subject to leaching, side dress a portion of the N at the time of the last cultivation. Under sprinkler irrigations, N can be injected through the lines throughout the season. On silt loam soils, split applications of N have not proven more effective as long as preplant N is adequately incorporated.

PHOSPHORUS (P)

Adequate phosphorus is necessary for maximum production of field corn. The soil test for P is based on samples collected from the first foot of soil. The soil is extracted with sodium bicarbonate. Economic response to fertilizer P is more likely with cooler soil temperatures and soils with high lime content, particularly when planting long season hybrids. Phosphorus is an immobile nutrient that does not move appreciably from where it is placed. It should be mixed into the seedbed or banded within easy reach of the seedling roots before or during the planting operation.

POTASSIUM (K)

Field corn requires adequate potassium for optimum growth. Soil test K can be useful in determining the need for K fertilizers. The soil sample is taken from the first foot of soil and extracted with sodium bicarbonate. Fertilizer K rates are based on soil test.

SULFUR (S)

The major corn-growing regions in Idaho should not experience shortages of S. Areas with S deficiencies include some irrigated areas where both the soil and irrigation water are low in S. Snake River water is known to have high S concentrations. Coarse-textured soils including sandy loams, loamy sands and sands would be more susceptible to S deficiencies than silt loam soils. Where the need for S is evident, use 30 pounds per acre of sulfate-sulfur (S04).

MICRONUTRIENTS

1) Zinc (Zn) deficiencies occur primarily on soils that are eroded, leveled or where the exposed subsoil is higher in lime. The DTPA test on soil samples collected from the first foot can be used for identifying Zn fertilizer needs. Apply 10 pounds of Zn per acre when the soil test measures less than 0.6 ppm.

2) Other micronutrients have not been shown to limit corn production. "Shotgun" applications of micronutrient mixtures containing boron (B), copper (Cu), iron (Fe) and manganese (Mn) "for insurance" have not been shown to be economical and are not recommended.

SALINITY (SALTS)

Field corn has a low to moderate tolerance to accumulated salts. Soils with total salt readings above 3 or 4 mmhos/cm can be cropped effectively. Readings up to 6 are also satisfactory although more careful water management may be required.

Small Grain, Winter, Haylage, Double Cropped

UNIVERSITY OF IDAHO INFORMATION

SOIL SAMPLING

Environmental concerns have brought nutrient management in agriculture under increased scrutiny. A goal of sound nutrient management is to maximize the proportion of applied nutrients that is used by the crop (nutrient use efficiency). Soil sampling is a best management practice (BMP) for fertilizer management that will help improve nutrient use efficiency and protect the environment.

SOIL SAMPLING is also one of the most important steps in a sound crop fertilization program. Poor soil sampling procedures account for more than 90 percent of all errors in fertilizer recommendations based on soil tests. Soil test results are only as good as the soil sample. Once you take a good sample, you must also handle it properly for it to remain a good sample. A good soil testing program can be divided into four operations: (1) taking the sample, (2) analyzing the sample, (3) interpreting the sample analyses, and (4) making the fertilizer recommendations.

GOOD SOIL SAMPLING starts with recognizing the soil fertility varies among and within fields. Soil sampling for plant nutrients should be done one to two weeks before the anticipated fertilizer application or planting date. To adequately characterize nutrient availability in a field, each soil sample submitted to a lab should consist of a composite of at least 20 individual subsamples representing the field's major soil characteristics. To determine Nitrogen availability, separate soil samples should be collected from the 0- to 12-inch depth and the 12- to 24-inch depth. All other nutrients require only a 0- to 12-inch sample. Samples should not be collected from poor production areas or wet spots unless specific recommendations are desired for those areas.

THE SUBSAMPLES should be thoroughly mixed in a clean plastic bucket, keeping the first-foot samples separate from the second-foot samples. About one pound of soil from each depth's composite sample should then be placed in a separate plastic-lined sampling bag. All requested information including grower's name, field identification, date, and previous crop should be provided with the sample. Soil samples should not be stored under warm conditions because microbial activity can change the extractable nitrate (NO₃-N) and (NH₄-N) concentrations. Accordingly, soil samples should be submitted to a local soil testing lab as quickly as possible to provide for accurate soil testing results. IF SIZABLE AREAS OF THE FIELD DIFFER in productivity or visual appearance, crop yield and quality the field may benefit from variable-rate fertilization. Current site-specific soil sampling and fertilizer application technologies provide useful options for providing optimal nutrient availability throughout the field. Information on soil nutrient mapping and variable-rate fertilization can be obtained by contacting an extension soil fertility specialist, your local county ag extension educator, crop advisor, or ag consultant. For more detailed information about soil sampling, refer to EXT 704, (Soil Sampling).

FERTILIZER GUIDE

NITROGEN (N)

Adequate nitrogen is necessary for maximum production of irrigated small grain haylage.

Nitrogen represents, by far, the largest share of fertilizer costs for small grain haylage in Idaho. The amount of nitrogen required depends on many factors which influence total small grain haylage production and quality. Both yield potential and available nitrogen ($\text{NO}_3 + \text{NH}_4$) should be considered when determining N fertilizer rates.

TOTAL N REQUIREMENTS BASED ON POTENTIAL YIELD - Fertilizer N rates should be used which correspond to the yield growers can reasonably expect under their soil and management conditions. The historical small grain haylage yield obtained by a grower in a specific field or area generally provides a fair approximation of yield potential given a grower's traditional crop management. Projected changes in crop management (i.e. improved variety, better disease and weed control) designed to appreciably increase production may require adjustment of yield potential upward. Research has shown that the available N required to produce a bushel of irrigated small grain haylage depends on a variety of crop management practices. Factors such as weed, insect and disease control as well as irrigation, planting date and soil type can influence the N required by small grain haylage for maximum yield. The results of irrigated field trials in the Boise and Magic valleys suggest as a rule that 60 pounds available N per ton of small grain haylage is required for maximum production.

AVAILABLE NITROGEN - Available N in the soil includes mineralizable N (released from organic matter during the growing season) inorganic N as nitrate ($\text{NO}_3\text{-N}$) and ammonium ($\text{NH}_4\text{-N}$), and N credits from previous cropping or manures. Each component of available N must be estimated for accurate determination of optimum fertilizer N rates.

MINERALIZABLE NITROGEN - Soils vary in their capacity to release N from organic matter during the growing season. The amount of N released depends on such factors as soil type, soil moisture, soil temperature, previous crop, and the history of fertilizer N applied. While soil organic matter content is frequently used to estimate annual mineralizable N contributions, in southern Idaho irrigated soils organic matter does not accurately predict the amount of N that is mineralized.

INORGANIC NITROGEN - Residual soil inorganic N (NO_3 , NH_4) can be evaluated most effectively with a soil test. Soil samples should be collected in foot increments to a depth of two feet, unless roots are restricted by dense soil layers or high water tables. Ammonium is generally low in preplant soil samples and thus contributes little to available N. However, it can be as high or higher than $\text{NO}_3\text{-N}$. $\text{NH}_4\text{-N}$ should be determined along with $\text{NO}_3\text{-N}$, especially when there is reason to expect the presence of appreciable $\text{NH}_4\text{-N}$, such as recent ammonium N fertilizer applications. A preplant soil sample is often only collected from the first foot of soil. Although this information is not as complete and reliable as would be provided by deeper sampling, residual N measurements from the first foot of soil can be combined with estimates of residual N in the second foot to predict N requirements for irrigated winter small grain haylage. For fall planted winter cereals in western Idaho, preplant soil test $\text{NO}_3\text{-N}$ in the second foot of the soil is commonly only one-half to two-thirds as high as in the first foot of soil. However, this estimate may not be accurate after potatoes or other sprinkler irrigated crops, especially in coarser textured soils. Basing N rate recommendations on estimates of residual N in the second foot increases the risk of recommending either too little or too much N.

NITROGEN FROM PREVIOUS CROP RESIDUES - Nitrogen associated with decomposition of previous crop residues should also be considered when estimating available N. Residues that require additional N for decomposition include cereal straw and mature sorghum/sudan stalks. Research has shown that 15 pounds of additional N are needed per ton of straw returned to the soil, up to a maximum of 50 pounds. For more information on compensating for cereal residues, refer to CIS 825, (Wheat Straw Management and Nitrogen Fertilizer Requirements). Row crop residues (potatoes, sugarbeets, and onions) generally do not require additional N for decomposition. Consequently, these residues have little effect on the N needs of winter small grain haylage. Legume residues from beans, peas, and alfalfa can release appreciable N during the following crop season that may not be reflected by the preplant soil test. This N is derived from the decomposition of both plant tops and nodulated root systems.

NITROGEN FROM MANURES - Soils in which winter small grain haylage is grown occasionally receive animal manures or lagoon wastes. Nutrient contributions from these sources should also be taken into consideration when estimating available N for the next season. Manures can preclude the need for any fertilizer, depending on the rate applied and their nutrient composition. Manures can vary appreciable depending on the animal, how the manure is processed, and the kind and extent of bedding material. For the most accurate estimate of fertilizer equivalent values, the manure should be analyzed for its nutrient content.

IRRIGATION WATER - Irrigation waters derived from deep wells are generally low in N. More shallow wells can have significant levels of nitrogen because of leaching of nitrogen from impacts from commercial fertilizer use, animal waste, and improperly functioning septic systems. Irrigation waters from most districts are also low in N when diverted from its source. Background levels of N from original sources are generally about 2 parts per million (ppm). The more return flow included in diverted water sources, the higher the N content. Return flows may include N dissolved when irrigation waters pass through fields high in residual or recently added fertilizer N as well as from soluble fertilizer N applied with the irrigation water. Most irrigation districts should know the N content of the water they divert. Contact them for this information to determine the levels of N added with your irrigation water. However, since irrigation water N levels are influenced by upstream management, if you use irrigation water that receives runoff after it is diverted, only a water test can accurately evaluate the N added with irrigation waters. For each ppm or milligrams per liter (mg/L) of N reported in the water sample, multiply by 2.7 to get the N added per acre foot of water applied. For example, if the water sample contained 10 ppm of N, 3 acre feet of water applied would be the equivalent of 81 pounds of N per acre. Typically, of the water applied with furrow irrigation only 50 percent is retained on the field and the rest runs off the end. The net retention of N applied with furrow irrigation would, therefore, be about half of the water applied or about 40 pounds per acre in this example. If more or less of the irrigation water is retained with each wetting, then growers should adjust the water N contribution accordingly. Excessive irrigation by any method reduces N availability to winter small grain haylage. Additional N may be needed under these conditions. Growers should not use aqua or anhydrous N through a sprinkler irrigation system. Water running soluble N sources with a furrow irrigation system can be an effective means of adding N. Two limitations of this practice are that (1) the application of the N with this method may not be as uniform as desired and (2) runoff containing the N may contaminate downstream surface waters. Growers can minimize the loss of N by shutting off the injection unit before the irrigation water reaches the

end of the furrow. This practice should not substitute for careful consideration of N needs while N can be side dressed. Nitrogen rates depend upon some of the following factors: previous crop, past fertilizer use, soil type and leaching hazard and realistic yield goal for the grower and the area.

CALCULATION OF N APPLICATION RATES - To calculate the fertilizer N application rate, the following equation is used: Fertilizer application rate (deficit) or Over application of Nitrogen = (Total N required to produce a given yield) - (Mineralizable N) - (Inorganic N measured by the soil test) - (previous crop/residue management) - (Manure Nitrogen) - Irrigation Water

TIMING OF NITROGEN APPLICATION - Excessive irrigation or heavy winter precipitation can result in leaching of nitrate N beyond the root systems. This hazard exists on all soils, but particularly on coarse textured soils such as sands, and sandy loams. Fall pre-plant N was once thought to be as good or preferable to spring top dressed N in calcareous silt loam or clay soils in areas of low rainfall. However, even under these conditions, southern Idaho research has shown that N applied in late winter or early spring is frequently used more effectively than early fall preplant applied N. Nitrogen fertilizers containing ammonium (ammonium sulfate, anhydrous or aqua ammonia, or urea) are less subject to leaching losses when lower soil temperatures (less than 40 F) inhibit the microbial conversion of ammonium to nitrate. Lower temperatures also reduce the microbial activity that is responsible for the immobilization of applied N. Late fall, split, or spring applied N is also recommended when residues from previous grain or mature sorghum/sudan crops are returned to the soil in early fall. Early spring N applications are more effective for increasing grain protein for irrigated hard red winter small grain haylage. Nitrogen applied after the boot stage will contribute more to grain protein than to yield. Most small grain haylage varieties respond in a similar way to N. However, varieties differ in their tolerance of high N rates. High N contributes to lodging of varieties with poor straw strength.

PHOSPHORUS (P)

Small grain haylage requires little phosphorus compared to the P requirements of other crops although minimum soil levels are necessary for maximum production. Adequate P is especially necessary for winter hardiness. Soil tests can indicate whether soils require phosphorus fertilization for maximum small grain haylage production. Soil samples are taken from the 0- to 12-inch depth. Broadcast plowdown, broadcasts seedbed incorporation or drill banding low rates of P with seed are effective methods of application. Drill banding may reduce the fertilizer P required. Drill banding high rates of P, especially ammonium phosphate fertilizers, can cause seedling damage. For more detailed discussion of banding, refer to PNW 283, (Fertilizer Band Location for Cereal Root Access).

POTASSIUM (K)

Small grain haylage has a lower requirement for K compared to sugarbeets, sorghum/sudan or potatoes. Soil tests can be useful indicators of the need for K. Potassium should be incorporated during seedbed preparation.

SULFUR (S)

Sulfur requirements for small grain haylage will vary depending on soil texture, previously

incorporated crop residues, leaching losses, S content of irrigation water and S soil test. Small grain haylage irrigated with Snake River water should not experience S shortages. Soils low in S (less than 10 ppm S_{04-S} in the plow layer or 8 ppm in the 0- to 12-inch depth) should receive 20 to 40 pounds of S per acre. Sulfur deficiency appears as a general yellowing of the plant early in the season and looks much like N deficiency. Plant analysis can be a useful means of differentiating between the two deficiencies. An N to S ratio of 17 in whole plant tissues is generally used for diagnosing sulfur deficient small grain haylage. Sulfur deficient small grain haylage has also been known to contain high nitrate nitrogen (N_{03-N}) concentrations.

MICRONUTRIENTS

Micronutrients have not been shown to be limiting small grain haylage production and "shotgun" application of micronutrient mixtures containing boron, manganese, iron and copper "for insurance" have not been shown to be responsive and are not suggested.

The above fertilizer guidelines are based on relationships established between University of Idaho soil test and crop yield response research. In this research, crop response to fertilizers was evaluated at several sites where the response to fertilizer differed. The recommendations reflect the general or overall response to fertilizers at specific soil test values and the response in individual fields can differ appreciably from the general table recommendation. Some sites will require less than the general recommendation, other sites more. Unfortunately, the science has not developed to the point where the table recommendations can account for all the unknown variables influencing the effectiveness of applied fertilizers at individual sites. The table fertilizer recommendations can only be used as general guides rather than specific recommendations for each and every field.

Furthermore, soil variability can sharply reduce the accuracy composite soil test values for individual fields. That is why large contiguous areas within fields should be sampled separately when they are known to differ in crop growth or soil characteristics known to influence the response to fertilizer. But soil variability frequently does not occur conveniently in large areas that can be sampled separately or fertilized differently. The fertilizer recommendations in most cases do not account for this variability. Soil test based recommendations may be excessive in some field areas and inadequate in other areas of the same field. The recommendations then will be appropriate only to the degree that the composite soil test values for fields actually represent the field. Thus, for fields that are highly variable, the fertilizer recommendations should be considered conservative estimates of fertilizers needed. All the more reason to consider the table fertilizer recommendations as general guides rather than specific recommendations for each and every field.

The fertilizer rates suggested in the tables will support above average yields if other factors are not limiting production. Therefore the recommendations assume that good crop management practices will be used, i.e. insect, disease, and weed control. Nutrient requirements can be met using either commercial fertilizers or equivalent organic matter sources, such as manure or compost, provided their nutrient content and relative availability are known or can be estimated from published literature. Soil test based recommended rates will not be appropriate if the soil

samples are improperly taken or do not represent the area to be fertilized. For nitrogen in particular, recommendations will be most accurate when crop history is taken into account and projected yields are reasonable estimates based on long term records.

General Comments:

- Over irrigation and nutrient loss is a hazard. Optimum irrigation management is necessary to meet crop water use needs and avoid loss of nutrients through leaching beyond the root zone and runoff with irrigation tail water.
- Nitrogen leaching is particularly a concern on sandy soils. Optimum management may require split Nitrogen applications to meet crop needs.
- Weed, insect, and disease control significantly influence the efficiency and effectiveness of your fertilizer applications and ultimately crop yield and farm profitability.
- Phosphorus, potassium, and zinc nutrients can be effectively fall-applied as they are not readily leached over winter.
- Phosphorus can be budgeted for a crop rotation.
- If you have questions regarding the interpretation of this information, please contact your Extension Agricultural agent, Crop consultant, or your commodity company fieldman.
- Both farm profitability and water quality can be improved with efficient nutrient use. The following are recommendations in nutrient management, which will optimize nutrient use for crop production while protecting water quality:
 - 1) Avoid the application of nutrient sources in close proximity to streams, wetlands, drainage ditches, areas of very shallow soils, and sinkholes.
 - 2) Accurately calibrate nutrient application equipment to insure that recommended rates are applied.
 - 3) Nitrogen recommendations for many crops are based on yield goals for the crops. It is important to establish realistic yield goals for each field based upon historical yield data, county averages, and your management practices to avoid unnecessary fertilizer costs and minimize potential water quality impairments.

Appendix D – U of I Manure Sampling Protocol CIS 1139

Manure and Wastewater Sampling

by Ron E. Sheffield and Richard J. Norell

Nutrient concentrations vary within most types of manure. A review of samples from 42 dairies in Idaho (Table 1) showed that nitrogen (N) and phosphorus (P) in wastewater lagoons vary greatly between farms. For example, on small open lot dairies (< 1,000 head), P can range from 16 to 28 pounds/per acre-inch while on large open lot dairies (> 1,000 head), the range is 12 to 20 pounds per acre-inch.

Phosphorus concentrations on freestall flush dairies ranged from 23 to 31 pounds per acre-inch, while scraped freestall dairies ranged from 17 to 39 pounds per acre-inch. This is a broad range of nutrient levels with the maximum and minimum values differing by more than a factor of two.

These numbers should send a clear message: Average nutrient estimates may be suitable for the purposes of developing a manure utilization plan, but these averages are not adequate for calculating proper application rates.

Do not base your application rates on laboratory test results from previous years because nutrient concentrations can change significantly, particularly when the manure has been exposed to the environment. For example, nutrient levels in a lagoon or storage pond can be greatly diluted by more rainfall than normal or concentrated due to excessive summertime evaporation.

Manure should be tested as close to the date of application as practical. Preferably, the sample should be taken as near the application time as possible prior to the manure application, or within 30 days of application. However, if you urgently need to pump down a full lagoon or storage pond, you should not wait until you can sample and obtain the results. Instead, you should sample the day of irrigation. The results can later be used to determine the nutrients applied to the fields and identify the need for additional nutrients to complete crop production.

Producers who do not test each manure source before or just after land application are faced with a number of ques-

tions they simply may not be able to answer:

- Am I supplying plants with adequate nutrients?
- Am I building up excess nutrients that may ultimately move to surface waters or groundwater?
- Am I applying heavy metals at levels that may be toxic to plants and permanently alter soil productivity?

Because environmental damage and losses in plant yield and quality often happen before visible plant symptoms, always have your manure analyzed by a competent lab. Certified labs in Idaho can analyze manure samples and may be able to make agronomic recommendations regarding the use of the manure as a fertilizer.

Manure sampling

Proper sampling is the key to reliable manure analysis. Although lab procedures are accurate, they have little value if the sample fails to represent the manure product.

Manure samples submitted to a lab should represent the average composition of the material that will be applied to the field. Reliable samples typically consist of material collected from a number of locations. Precise sampling methods vary according to the type of manure. The lab, county extension agent, or crop consultant should have specific instructions on sampling, including proper containers to use and maximum holding or shipping times. General sampling recommendations follow.

Preparing liquid manure for lab analysis. Liquid manure samples submitted for analysis should meet the following requirements:

- Place sample in a sealed, clean plastic container with about a 1-pint volume. Glass is not suitable because it is breakable and may contain contaminants.

Table 1. Average lagoon wastewater concentrations from various types of Idaho dairies.

Farm Type ¹	Ammonia (NH ₃) lb/ac-in	Total Kjeldahl Nitrogen (TKN) lb/ac-in	Total Phosphorus (TP) lb/ac-in	Total Solids (TS) mg/l	Biochemical Oxygen Demand (BOD) mg/l
OL < 1,000 hd	40 +/- 2	119 +/- 29	22 +/- 6	29,291 +/- 12,098	21,067 +/- 20,240
OL > 1,000 hd	61 +/- 22	92 +/- 36	16 +/- 4	5,087 +/- 1,386	1,068 +/- 192
FS Scrape	175 +/- 75	181 +/- 75	28 +/- 11	24,122 +/- 13,826	2,135 +/- 968
FS Flush	149 +/- 23	162 +/- 24	27 +/- 4	10,770 +/- 2,138	1,912 +/- 481

¹ Farm Type: OL = Open Lot Dairy; FS = Freestall Dairy; hd = head.

² Average values +/- standard error.

- Leave at least 1 inch of air space in the plastic container to allow for expansion caused by the release of gas from the manure material.
- Refrigerate or freeze samples that cannot be shipped on the day they are collected, minimizing chemical reactions and pressure buildup from gases.

Ideally, liquid manure should be sampled after it is thoroughly mixed. Because this is sometimes impractical, samples can also be taken in accordance with the suggestions that follow.

Lagoon liquid. Premixing the surface liquid in the lagoon is not needed, provided it is the only component that is being pumped. Growers with multistage systems should draw samples from the lagoon they intend to pump for crop irrigation.

Samples should be collected using a clean, plastic container similar to the one shown in **Figure 1**. One pint of material should be taken from at least eight sites around the lagoon and then mixed in the larger clean, plastic container. Effluent should be collected at least 6 feet from the lagoon's edge at a depth of about a foot. Shallower samples from anaerobic lagoons may be less representative than deep samples because oxygen transfer near the surface sometimes alters the chemistry of the solution. Floating debris and scum should be avoided. One pint of mixed material should be sent to the lab. Galvanized containers should never be used for collection, mixing, or storage due to the risk of contamination from metals like zinc in the container.

A University of Idaho study compared nutrient composition from two sampling locations: direct from storage and during land application. Nitrogen concentration averaged 15 pounds per acre-inch higher in storage samples than from land application samples. Conversely, phosphorus and potassium concentrations were similar between storage and land application samples. Nitrogen application rates may be overestimated if based on nutrient analysis from storage samples.

These recommendations are adequate for average irrigation volumes. If an entire storage structure is to be emptied by such means as furrow irrigation, more frequent sampling with many more sampling points is recommended.

Liquid slurry. Manure materials applied as a slurry (approximately 5 to 12 percent solids) from a pit, storage pond, or vacuumed from a feed alley should be mixed prior to sampling. If you agitate your pit or basin prior to sam-

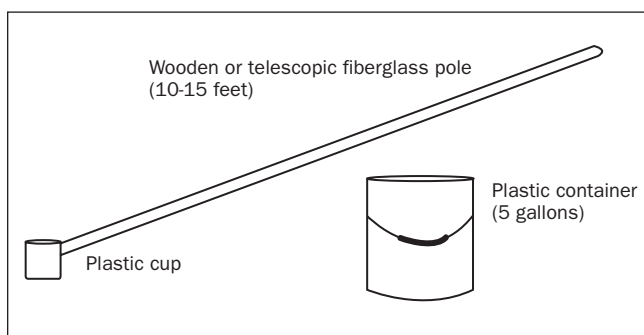


Figure 1. Liquid manure sampling devices like these can be purchased or made.

pling, a sampling device pictured in **Figure 1** can be used. If you wish to sample a storage structure without agitation, you must use a composite sampling device as shown in **Figure 2**. Manure should be collected from approximately eight areas around the pit or pond and mixed thoroughly in a clean, plastic container. An 8- to 10-foot section of 0.5- to 0.75-inch plastic pipe can also be used: extend the pipe into the pit with ball plug open, pull up the ball plug (or press your thumb over the end to form an air lock), and remove the pipe from the manure, releasing the air lock to deposit the manure in the plastic container.

Lagoon sludge. The best time to take a sludge sample is while measuring for volume of sludge in a lagoon. This allows samples to be collected from several points around the interior of the lagoon. How the sample is collected depends on how the sludge will be removed. Depending on the density and nutrient concentration of the lagoon effluent, the samples may differ by up to 100 percent from point to point.

To draw a sample, use the same type of sampler as described above for manure slurry (**Figure 2**) and lower the sampler until it almost reaches the bottom. Avoid using a commercial "sludge-judge," because experience has shown that these devices do not work well on thick manure sludge and settled solids.

Wearing plastic or latex gloves, collect a core or profile of lagoon effluent and sludge. Once the pipe is over a clean 5-gallon plastic bucket, slowly break the vacuum by removing your finger from the end of the pipe. If the entire lagoon is going to be agitated during sludge removal, the entire core of collected sludge and effluent should be sent to the laboratory. If the lagoon effluent is going to be drawn down and primarily only sludge pumped out, then just the collected sludge should be sent to the lab. If you are unsure how the sludge will be removed, take samples using both methods, label them separately, and have both analyzed.

Place several samples in the bucket and mix thoroughly before removing a sub-sample for analysis. Consider using a plastic, wide-mouth bottle when shipping samples to the laboratory.

Solid Manure. Solid manure samples should represent the manure's average moisture content. If the material varies

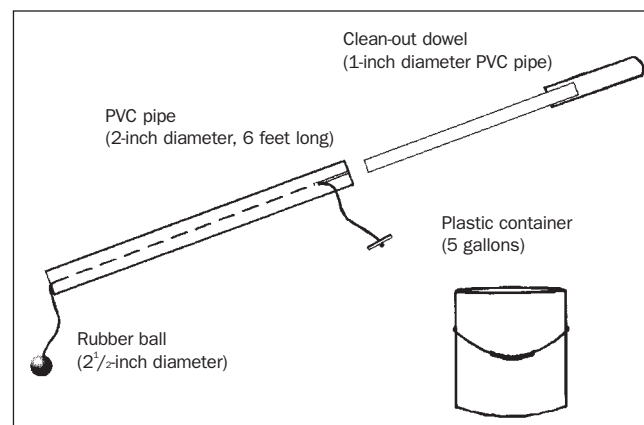


Figure 2. Composite sampler for slurries and lagoon sludge or settled solids includes a collecting PVC pipe and a clean-out dowel (smaller PVC pipe), string, and a rubber ball big enough to cover one end of the collecting pipe.

greatly in its moisture content, you should submit at least 3 samples to a laboratory and take an average of each analysis.

A 1-quart sample is adequate for analysis. Samples should be taken from approximately 8 different areas in the manure pile, placed in a clean plastic container, and thoroughly mixed. Samples should be taken wearing plastic or latex gloves and using a plastic or stainless steel hand shovel or trowel. Do not use galvanized trowels or buckets because they will likely contaminate the sample, rendering falsely high concentrations of metals like zinc in the analysis. Approximately 1 quart of the mixed sample should be placed in a plastic bag, sealed, and shipped directly to the lab. Samples stored for more than 1 day should be refrigerated.

Stockpiled manure or litter. Ideally, stockpiled manure and separated solids should be stored under cover on an impervious surface. The weathered exterior of uncovered waste may not accurately represent the majority of the material. Additionally, rainfall will move water-soluble nutrients down into the pile. If an unprotected stockpile is applied over an extended period, it should be sampled before each application.

Stockpiled manure should be sampled at a depth of at least 18 inches at 6 or more locations around the pile. The collected material should be combined in a plastic container and mixed thoroughly. The 1-quart lab sample should be taken from this mixture, placed in a plastic container or bag, sealed, and shipped to the lab for analysis. If the sample cannot be shipped within one day of sampling, it should be refrigerated.

Surface-scraped manure. Surface-scraped and piled materials should be treated like stockpiled manure. Follow the same procedures for taking samples. Ideally, surface-scraped materials should be protected from the weather unless they are used immediately.

Composted manure. Ideally, composted manure should be stored under cover on an impervious surface. Although nutrients are somewhat stabilized in these materials, some nutrients can leach out during rains. When compost is left unprotected, samples should be submitted to the lab each time the material is applied. Sampling procedures are the same as those described for stockpiled manure.

Who can analyze my manure sample?

Both public and private labs analyze manure samples. Use only labs that are certified or conduct their analysis according to the North American Proficiency Testing – Manure Assessment Program (NAPT-MAP) to test manure and wastewater, or the North American Proficiency Testing – Compost Assessment Program (NAPT-CAP) to test compost. Private labs can be found through local Cooperative Extension Service (CES) agents, state regulators, or on the NAPT-MAP Web site: <http://ghex.colostate.edu/map/>.

Deciding which lab to use depends on several factors:

- Is the lab certified or does it conduct its analysis according to NAPT-MAP or NAPT-CAP guidelines?
- What is the cost to run the sample?

- How long will it take to get your results?
- Does the lab offer all parameters needed for your operation?
- Can you get your sample to the lab in the required time?

When you have selected a lab to analyze the manure, you need to follow its specific sample requirements. Many labs offer sample containers that they ask you to use. Sample collection procedures, including holding times allowed and refrigeration and shipping requirements, must be closely followed to obtain accurate results. One standard that applies to all labs and sampling recommendations is to sample as close to the application time as possible.

Essential analyses include concentrations of essential plant nutrients, including nitrogen as ammonium ($\text{NH}_4\text{-N}$), and Total Kjeldahl Nitrogen (TKN), Total phosphorus (TP) and potassium (K). Additionally, you may consider sampling for nitrate ($\text{NO}_3\text{-N}$), dissolved phosphorus ($\text{PO}_4\text{-}$), calcium (Ca), magnesium (Mg), sulfur (S), iron (Fe), manganese (Mn), zinc (Zn), copper (Cu), boron (B), dry matter content or total solids (TS), pH, and electrical conductivity (for liquid samples). Where applicable, check your NPDES permit (National Pollutant Discharge Elimination System) for specific sampling requirements.

What does my manure analysis report tell me?

Lab results may be presented in a number of ways. The easiest to use is a wet, “as-is” basis in pounds of available nutrient (N, P, or K) (1) per ton; (2) per 1,000 gallons of manure or wastewater; or (3) per acre-inch of manure or wastewater.

If a lab reports results on a dry basis, you must have the moisture content of the manure to convert the results back to a wet basis. A lab may also give results as a concentration (parts per million [ppm] or milligram per liter [mg/l]), which likewise requires conversion factors to get the results into a usable form based on how you apply the manure. Finally, if a lab reports P and K as elemental P and K, you must convert them to the fertilizer basis of P_2O_5 or K_2O . This can be done with the following conversions:

$$\text{P} \times 2.29 = \text{P}_2\text{O}_5$$

$$\text{K} \times 1.20 = \text{K}_2\text{O}$$

Select a lab that reports an analysis on an “as-is” basis in the units of measure most useful to your operation.

Most useful information

The most useful information is predicted nutrients available for the first crop. Nutrient availability is predicted based on estimates of manure breakdown and nutrient loss according to application method. If the lab does not report plant-available nutrients, contact your nutrient management planner, a certified crop advisor, or your local extension office for assistance.

Of the total nutrients predicted to be available for the first crop, 50 to 75 percent will likely become available during the first month. It is, therefore, important to apply manure near the time nutrients are required by plants. The remaining nutrients gradually become available over the next three months. Nutrients not available for the first crop are slowly

released to available forms over time. In soils that do not readily leach with heavy rainfall, nutrients may accumulate to significant quantities over time.

You should review the report to see if the analysis is within the expected ranges for your manure. It is common for manure analyses to vary between seasons, due to excess rainfall, drought, or changes in management practices. However, you should compare your results to the results from previous manure reports to ensure that they appear reasonable. If your results are significantly different from what you expected, it is advisable to resample the manure. The original sample may have been mislabeled or improperly collected, and thus not be representative of the manure.

To meet a specific plant nutrient requirement, nutrients listed in the report or calculated as “available for the first crop” should be used in determining the actual application rate. For the availability prediction to be reliable, you must have properly identified the type of manure and the application method on the information sheet submitted to the lab. It is important to understand that nutrient availability cannot be determined with 100 percent accuracy. Many variables, including the type of manure product and environmental factors (i.e., soil type, rainfall, temperature, and general soil conditions), influence the breakdown of the manure and nutrient loss. Remember, the worst sample of your manure is always better than the best book value.

About the authors

Ron E. Sheffield, is a University of Idaho Extension waste management engineer at the Twin Falls Research & Extension (R&E) Center and assistant professor in the University of Idaho Department of Biological and Agricultural Engineering, rons@uidaho.edu.

Richard J. Norell is a University of Idaho Extension dairy specialist with the Idaho Falls R&E Center, rnorell@uidaho.edu.

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Extension

Appendix E – U of I Soil Sampling Bulletin 704 revised

Soil Sampling

*Bulletin 704
(revised)*

*R. L. Mahler and
T. A. Tindall*



*College of
Agriculture*



University of Idaho
Cooperative Extension System

Soil Sampling



Environmental concerns have brought nutrient management in agriculture under increased scrutiny. A goal of sound nutrient management is to maximize the proportion of applied nutrients that is used by the crop (nutrient use efficiency). Soil sampling is a best management practice (BMP) for fertilizer management that will help improve nutrient use efficiency and protect the environment.

Soil sampling is also one of the most important steps in a sound crop fertilization program. Poor soil sampling procedures account for more than 90 percent of all errors in fertilizer recommendations based on soil tests. Soil test results are only as good as the soil sample. Once you take a good sample, you must also handle it properly for it to remain a good sample.

A good soil testing program can be divided into four operations: (1) taking the sample, (2) analyzing the sample, (3) interpreting the sample analyses, and (4) making the fertilizer recommendations. This publication focuses on the first step, collecting the soil sample.

Once you take a sample, you must send it to a laboratory for analysis. Then the Extension agricultural educator or fertilizer fieldman in your county can interpret the analysis and make specific fertilizer recommendations. Fertilizer guides from the University of Idaho Cooperative Extension System are also available to help you select the correct fertilizer application rate.

The soil sampling guidelines in this publication meet sampling standards suggested by federal, state, and local nutrient management programs in Idaho.

What is a soil test?

A soil test is a chemical evaluation of the nutrient-supplying capability of a soil at the time of sampling. Not all soil-testing methods are alike nor are all fertilizer recommendations based on those soil tests equally reliable.

Reliable fertilizer recommendations are developed through research by calibrating laboratory soil test values and correlating them with crop responses to fertilizer rates. These soil test correlation trials must be conducted for several years on a particular crop growing on a specific soil type. If soil test calibration is incomplete, fertilizer recommendations based on soil-test results still can only be best guesses.

A soil test does not measure the total amount of a specific nutrient in the soil. There is usually little relationship between the total amount of a nutrient in the soil and the amount of a nutrient that plants can obtain.

A soil test also does not measure the amount of plant-available nutrients in the soil because not all the nutrients in the soil are in a form readily usable by plants. Through research, however, a relationship can usually be established between soil test nutrient levels and the total amount of a nutrient in the soil.

What does a soil test measure?

Present soil-testing methods measure a certain portion of the total nutrient content of the soil. During testing, this portion is removed from the soil by an extracting solution that is mixed with the soil for a given length of time. The solution containing the extracted portion of the nutrient is separated from the soil by filtration, and then the solution is analyzed.

A low soil-test value for a particular nutrient means the crop will be unable to obtain enough of that nutrient from the soil to produce the highest yield under average soil and climatic conditions. A nutrient deficiency should be corrected by adding the nutrient as a fertilizer. The amount of nutrient that needs to be added for a given soil-test value is calculated based on results from the correlation research test plots.

Sampling timing

Because nutrient concentrations in the soil vary with the season, you should take soil samples as close as possible to planting or to the time of crop need for the nutrient. Ideally, take the soil samples 2 to 4 weeks before planting or fertilizing the crop. It usually requires 1 to 3 weeks to take a soil sample, get the sample to the testing laboratory, and obtain results.

Sampling very wet, very dry, or frozen soils will not affect soil test results

though collecting soil samples under these conditions is difficult. Do not sample snow-covered fields. The snow makes it difficult to recognize and avoid unusual areas in the field, so you may not get a representative sample.

Sampling frequency

For best soil fertility management, especially for the mobile nutrients, sample each year and fertilize for the potential yield of the intended crop. Having an analysis performed for every nutrient each year is not necessary. Whether you need an analysis of a nutrient depends on such things as its mobility in the soil and the nutrient requirements of the crop.

Take soil samples at least once during each crop rotation cycle. Maintain a

record of soil test results on each field to evaluate long-term trends in nutrient levels.

Sampling procedure

One of the most important steps in a soil testing program is to collect a soil sample that represents the area to be fertilized. If the soil sample is not representative, the test results and recommendations can be misleading.

The correct steps in soil sampling are illustrated in figure 1. Before sampling, obtain necessary information, materials, and equipment from the Extension agricultural educator or fertilizer fieldman in your county.

Use proper soil sampling tools. A soil auger or probe is most convenient, but

you can use a shovel or spade for shallow samples. You will need a plastic bucket or other container for each sample to help you collect and mix a composite sample.

Be sure that all equipment is clean, and especially be sure it is free of fertilizer. Even a small amount of fertilizer dust can result in a highly erroneous analysis. Do not use a galvanized bucket when analyzing for zinc (Zn) or a rusty shovel or bucket when analyzing for iron (Fe). If the sample will be analyzed for Fe or manganese (Mn), do not dry the soil sample before shipping.

When sampling, avoid unusual areas such as eroded sections, dead furrows, and fence lines. If the field to be sampled covers a large area with

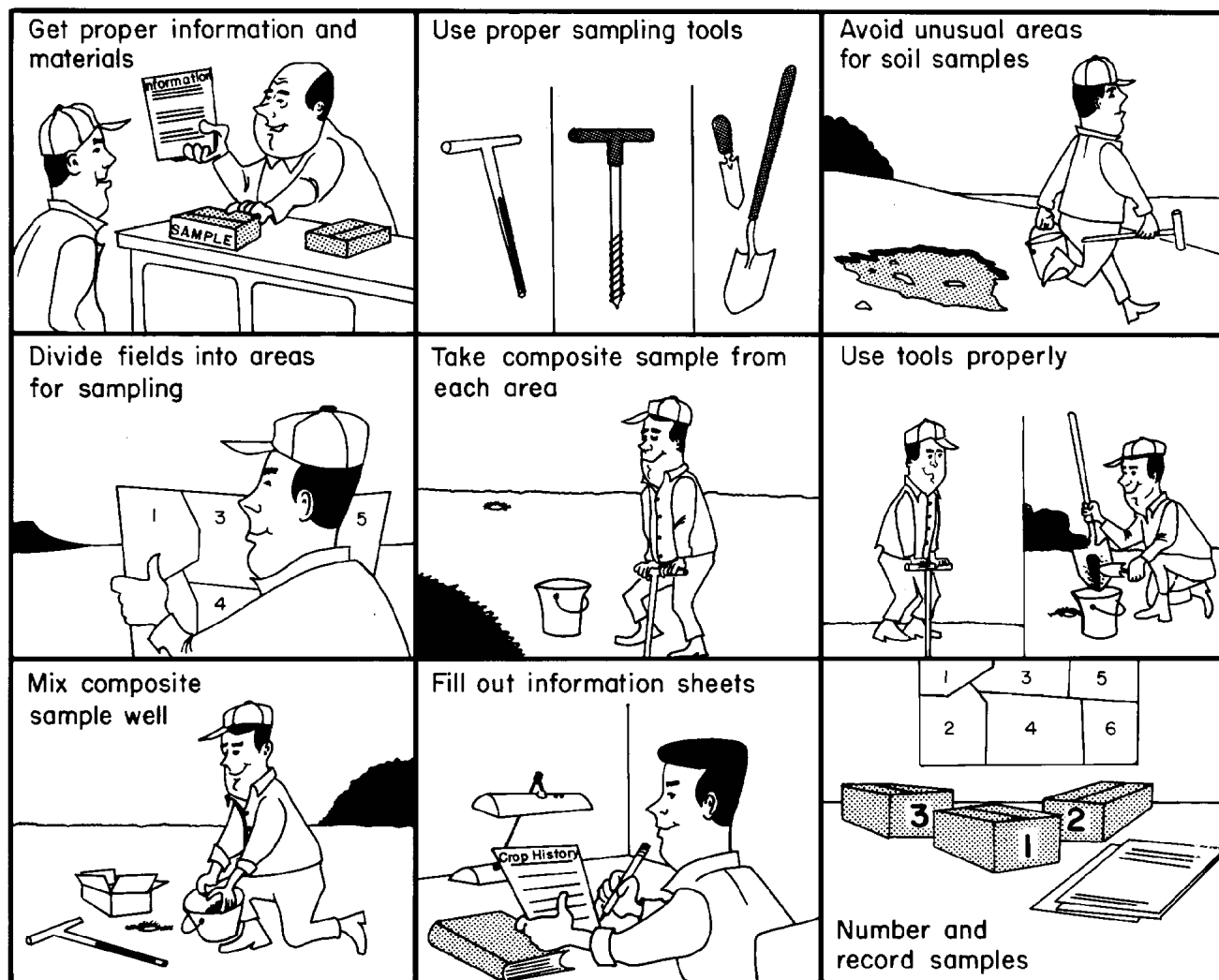


Fig. 1. Follow these steps to obtain a good sample for testing (redrawn courtesy of the National Fertilizer Institute).

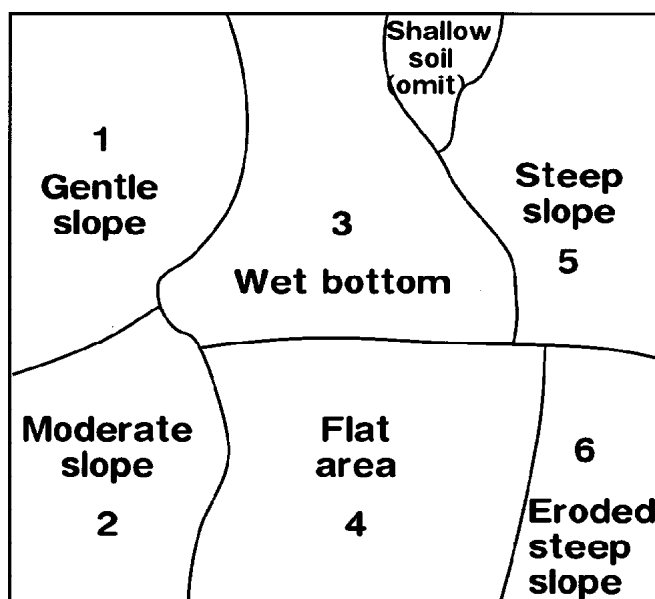


Fig. 2. A field with areas identified as sampling units.

varied topography, subdivide it into relatively uniform sampling units (fig. 2). Sampling subdivision units that are too small to fertilize separately may be of interest, but impractical if you do not treat the small units differently from the rest of the field. Omit these areas from the sampling.

Within each sampling unit take soil samples from several different locations and mix these subsamples into one composite sample. The number of subsamples needed to obtain a representative composite sample depends on the uniformity and size of the sampling unit (table 1). Although the numbers of subsamples in table 1 give the best results, they may be unrealistic if you plan to take a great number of samples. An absolute minimum of 10 subsamples from each sampling unit is necessary to obtain an

acceptable sample. The more subsamples you take, the better the representation of the area sampled.

Take all subsamples randomly from the sampling unit, but be sure to distribute subsample sites throughout the sampling unit. Meander or zig-zag throughout each sampling unit to sample the area. Special considerations are necessary in eroded areas, furrow irrigation, under no-till, and where fertilizer is banded (see "Special Sampling").

The total amount of soil you collect from the sampling unit may be more

Table 2. Effective rooting depth for some common Idaho crops.

Crop	Depth (feet)
Cereals (wheat, barley, oats)	5 to 6
Corn	5 to 6
Alfalfa, rapeseed	4 to 5
Hops, grapes, tree fruits	4 to 5
Sugarbeets	2 to 3
Peas, beans, lentils, onions, potatoes, mint	2
Vegetable seed	1 to 1½

than you need for analyses. Mix the individual subsamples together thoroughly and take the soil sample from the composite mixture. The composite sample should be at least 1 pint—about 1 pound—in size.

Sampling depth

Depth of sampling is critical because tillage and nutrient mobility in the soil can greatly influence nutrient levels in different soil zones (fig. 3). Sampling depth depends on the crop, cultural practices, tillage depth, and the nutrients to be analyzed.

Because the greatest abundance of plant roots, greatest biological activity,

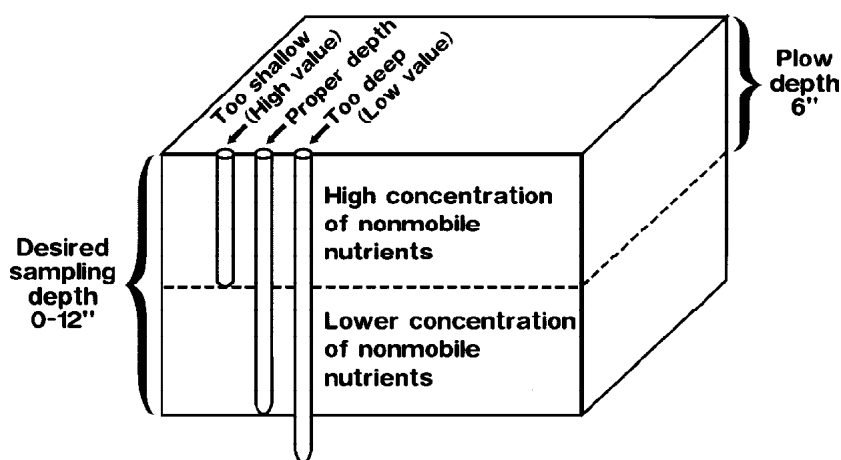


Fig. 3. Too deep or shallow a sampling depth can produce inaccurate soil test results. The plow layer is usually higher in nonmobile nutrients than the soil layers below it.

Table 1. Number of subsamples recommended for a representative composite sample based on field size.

Field size (acres)	Number of subsamples
fewer than 5	15
5 to 10	18
10 to 25	20
25 to 50	25
more than 50	30

and highest nutrient levels occur in the surface layers, the upper 12 inches of soil are used for most analyses. The analyses run on the surface sample include soil reaction (pH), phosphorus (P), potassium (K), organic matter, sulfur (S), boron (B), zinc (Zn), and other micronutrients.

Sampling depth is especially critical for nonmobile nutrients such as P and K. The recommended sampling depth for nonmobile nutrients is 12 inches (fig. 3).

The tillage zone, typically 6 to 8 inches deep, usually contains a relatively uniform, high concentration of nonmobile nutrients. Below the tillage zone the concentration is usually lower. Therefore, a sample from the tillage zone will usually have a higher content of nonmobile

nutrients than a sample from the desired 0- to 12-inch sample depth. This can lead to erroneous results.

Depth sampling

When sampling for mobile nutrients such as nitrogen (N), boron (B), and sulfur (S), take samples by 1-foot increments to the effective rooting depth of the crop (fig. 4). This can be a depth of 5 to 6 feet (table 2) unless the soil has a root-limiting layer such as bedrock or hardpan. For each foot depth, take 10 or more subsamples at random from the sampling unit.

If you plan to sample less than a year after banding or injecting fertilizer or if you have any question about fertilizer placement, use the sampling technique described under "Areas

Where Fertilizer Has Been Banded." Irrigation or precipitation should disperse mobile nutrients over a period of a year.

Sample handling

Soil samples need special handling to ensure accurate results and minimize changes in nutrient levels because of biological activity. Keep moist soil

samples cool at all times during and after sampling. Samples can be frozen or refrigerated for extended periods of time without adverse effects.

If the samples cannot be refrigerated or frozen soon after collection, air dry them or take them directly to the soil testing laboratory. Air dry by spreading the sample in a thin layer on a plastic sheet. Break up all clods or lumps, and spread the soil in a layer about 1/4 inch deep. Dry at room temperature. If a circulating fan is available, position it to move the air over the sample for rapid drying.

Caution: Do not dry where agricultural chemical or fertilizer fumes or dust will come in contact with the samples. Do not use artificial heat in drying. Ask the Extension agricultural educator or fertilizer fieldman in your county for more details concerning special handling of soil samples.

When the soil samples are dry, mix the soil thoroughly, crushing any coarse lumps. Take from the sample about 1 pint (roughly 1 pound) of well-mixed soil and place it in a soil sample bag or other container. Soil sample bags and soil test report forms are available from the Cooperative Extension System office in your county or from a fertilizer fieldman.

Label the bag carefully with your name, the sample number, sample depth, and field number. The field number should correspond with a field or farm map showing the areas

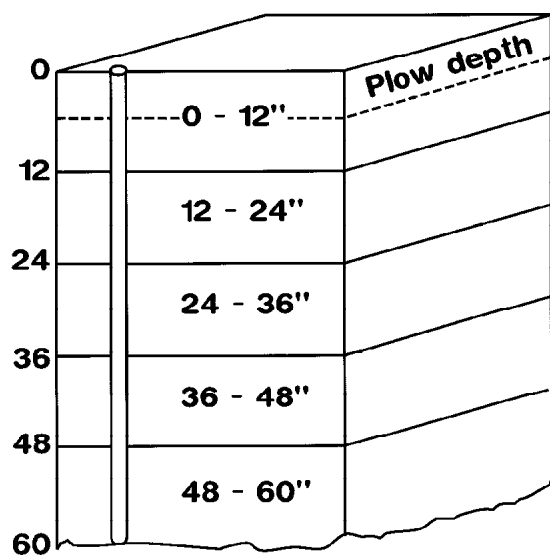


Fig. 4. Depth sampling (successive samples by 12-inch increments) for mobile nutrients (especially N) should be continued to rooting depth, which may be 5 to 6 feet for some crops.

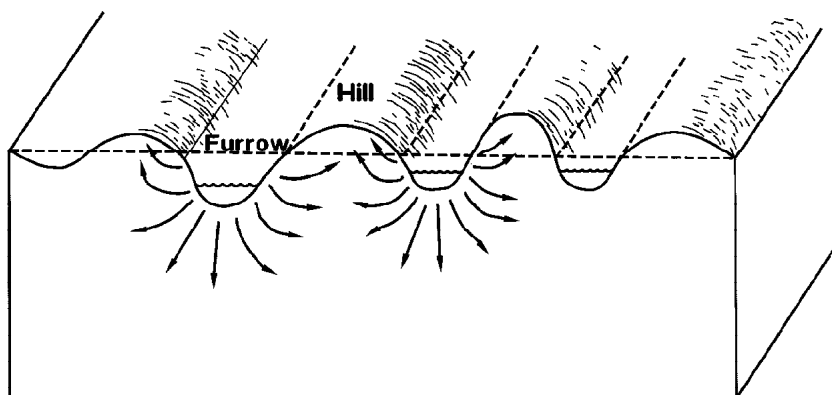


Fig. 5. Movement of mobile nutrients in furrow-irrigated fields.

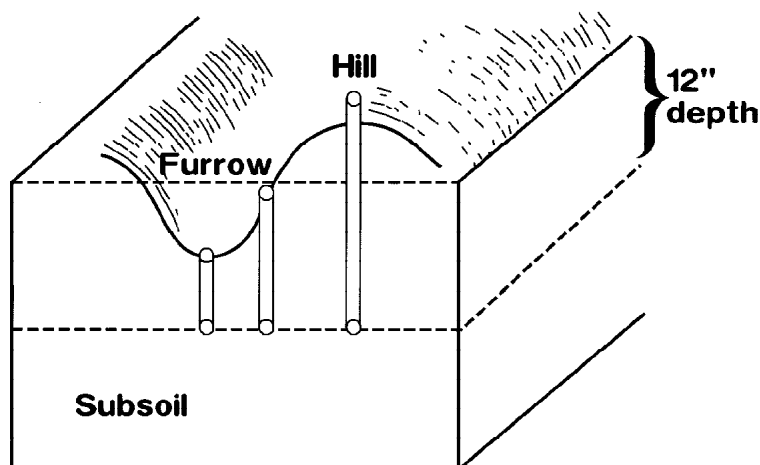


Fig. 6. Special sampling techniques are required when soil sampling furrow-irrigated fields. Take a sample from the hilltop, the furrow bottom, and at the midpoint between the hilltop and furrow bottom. The 12-inch sampling depth is based on the midpoint sampling location.

sampled. This will help you keep an accurate record of soil test reports. Provide information on crop to be grown, yield potential, recent history of crops grown, yields, fertilizer applied, and other information.

Sample analysis

Analyze regularly only for those nutrients that have been shown to be yield limiting in your area or for the crop to be grown. In general, all soils should be analyzed for N, P, K, and S. For determination of potential need for micronutrients, refer to PNW 276, *Current Nutrient Status of Soils in Idaho, Oregon, and Washington*. Occasional analyses for micronutrient concentrations may be advisable.

Special sampling

Special sampling problems occur in fields that have been leveled for irrigation, fields that have lost all or most topsoil as a result of erosion, fields that are surface (furrow)

irrigated, fields that have had a fertilizer band applied, and fields that are not thoroughly tilled.

Land-leveled and eroded areas

Areas that have been eroded or artificially leveled for irrigation usually have little or no original topsoil. The soil surface may be exposed subsoil material. These areas should be sampled separately if they are large enough to be managed differently from where topsoil has not been removed. Subsoil material is usually low in organic matter and can be high in clay, calcium carbonate (lime), or both.

For a representative soil sample, sample furrow-irrigated fields before the furrowing operation. If furrowing has already been completed, follow the special sampling procedures described here.

The movement of water and dissolved plant nutrients can create unique nutrient distribution patterns in the hills between the furrows (fig. 5). To obtain a representative sample, you need to be aware of furrow direction, spacing, and location, and to take closely spaced soil samples perpendicular to the furrow (fig. 6).

Approximately 20 sites (with at least three samples per site) are needed for a representative composite soil sample. At each sampling site, take a sample from the hilltop, from the midpoint between the hilltop and furrow, and from the furrow bottom. The sampling depth at the midpoint between the hilltop and furrow bottom should be 12 inches. The bottom point of this sample should be the same as for the furrow and hilltop samples. Thus, the furrow sampling depth will be less than 12 inches, while the hilltop sampling depth will be more than 12 inches (fig. 6).

Mix the hilltop, midpoint, and furrow samples to make a composite sample for each site. Mix the site samples for a representative composite field soil

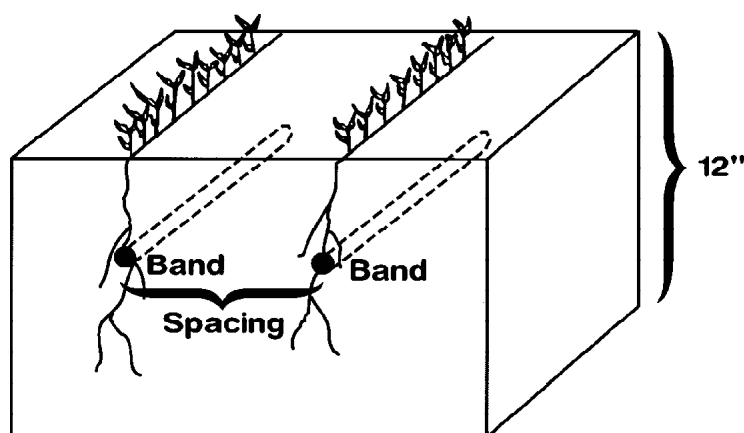


Fig. 7. Diagram of fertilizer location in soil where fertilizer has been banded.

sample to be analyzed for nonmobile nutrients (P, K, and micronutrients). Deeper profile sampling (depth sampling) is recommended for mobile nutrients (N and S).

Areas where fertilizer has been banded

Banding of fertilizers is becoming a more common practice (fig. 7). In fields where fertilizers have been banded and tillage has occurred before soil sampling, regular sampling procedures can be followed. However, if tillage has not adequately mixed the soil, special soil sampling is required. If a field has had a banded fertilizer application the previous growing season and has not been plowed, an ideal sample would be a continuous slice 1 to 2 inches thick and 12 inches deep extending from the center of one band to the center of the next band.

Little research has been conducted to determine the best method of sampling banded fields. Currently three different approaches are used widely. Each method produces a satisfactory representative sample, but the effort required to obtain these samples differs considerably.

Systematic sampling method . If you know the direction, depth, and spacing of the fertilizer band, you can obtain a representative soil sample with this sampling procedure. Take 5 to 10 soil samples perpendicular to the band row beginning in the edge of a fertilizer band and ending at the edge of an adjacent band (fig. 8). Follow this procedure on at least 20 sampling sites in each field or portion of a field being sampled. Mix and composite the soils collected from each site to obtain a representative soil sample.

Controlled sampling method. You also should know the direction, depth, and spacing of the fertilizer bands to obtain a representative soil sample with this method. Take 20 to 30 soil cores from locations scattered throughout the field or portion of the field. Avoid sampling directly in a fertilizer band.

The composite sample should adequately represent the area being sampled. This method may result in slightly lower soil test values of nonmobile nutrients (P, K, and micronutrients) than the systematic and random sampling methods.

Random sampling method . Use this sampling method when the location of the previous season's fertilizer bands is not known. Take 40 to 60 random soil cores to form a composite sample of the area being sampled.

Reduced tillage or no-till fields

You may need special approaches to soil sampling with reduced tillage or no-till fields because the soil has been disturbed so little that fertilizer, whether broadcast on the surface or banded below the surface, is not mixed into the soil. You need to know the history of fertilization, tillage, and other management practices to determine how to obtain a representative sample.

If nonmobile nutrients (P, K, and micronutrients other than B) have been surface broadcast and little or no tillage has been used since their application, remove the surface 1 inch of soil before sampling. Nutrients in the top inch of soil will probably not be available to the growing crop.

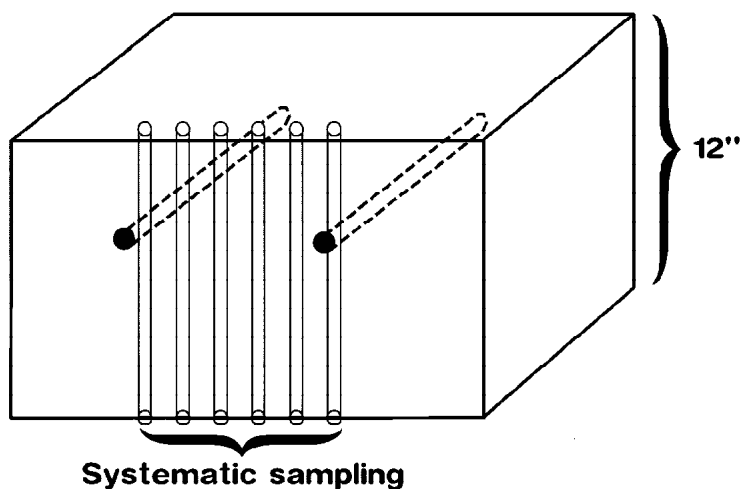


Fig. 8. Systematic soil sampling in a field where fertilizer has been banded (sampling method 1).

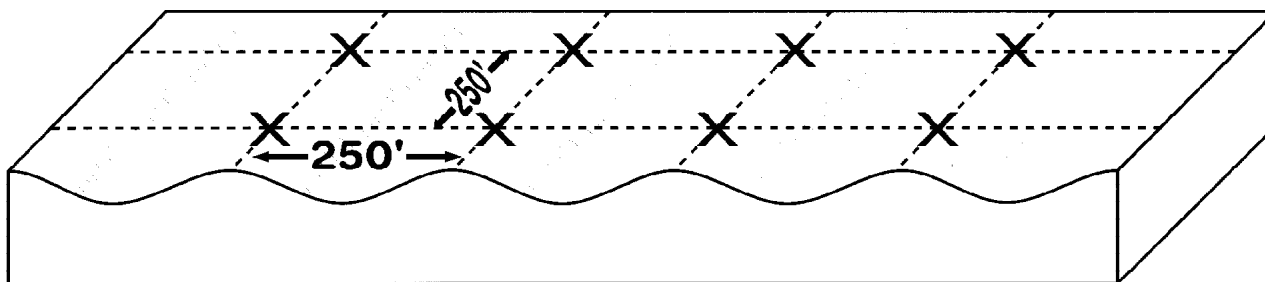


Fig. 9. Grid soil sampling pattern where samples are collected every 250 feet. Note that a complete soil sample is collected at each spot marked with an X.

If fertilizer has been banded with the no-till system, consider methods suggested in “Areas Where Fertilizer Has Been Banded.” If a field has been under a continuous no-till system for a long time, determine the pH of the surface foot at 3-inch intervals (0 to 3, 3 to 6, 6 to 9, 9 to 12 inches) every 3 to 5 years. Soil pH will affect the availability of fertilizer nutrients as well as the activity of commonly used herbicides, insecticides, and fungicides.

Grid sampling in nonuniform fields

Many fields are not uniform and vary both horizontally and vertically across landscapes. Traditional soil sampling procedures average nutrient levels in soil subsamples to determine average nutrient levels in the field. The nutrient values obtained are good, but the manager must realize that many of the values in the field are either less than or greater than the values determined. When fields are broken into grids with shorter distances between the sampling points a more precise soil map can be developed to determine nutrient needs.

The technology is now available to combine grid sampling with variable

rate fertilizer application to handle spatial variability within a field. These application techniques make fertilizer nutrient application more precise, resulting in greater nutrient use efficiency and reducing pollution potential.

Irrigated fields including individual pivots should be set up in a 200- to 300-foot grid for potato, sugarbeets, corn, and other potentially high-N-use crops (fig. 9). A wider grid of 400 feet may be used for small grains, beans, and other crops where N management is less intensive or under dryland conditions.

Soil nutrient needs for each segment of the grid are entered into a computer-driven system mounted on specialized commercial fertilizer application equipment. Variable rates of nutrients are then applied based on individual soil samples over the entire field.

A similar system designed for fertilizer applications through pivot sprinklers is being developed by the University of Idaho. This system has the potential to apply variable rates of nutrients and water specifically related to changes across individual fields.

The Soil Conservation Service has a digitized soil survey information system (SSIS), which when combined with the results of grid sampling provides specific information and recommendations for soils and soil types within a field. The SSIS can locate pockets of sandy or coarse-textured soils where leaching is a major concern or areas of finer-textured soils where pockets of residual N may occur. The SSIS also indicates where erosion or surface runoff may be high and where areas should be targeted for federal programs such as the Conservation Reserve Program.

Another computer-mapping technique, Geographic Information Systems (GIS), can be combined with the results of grid sampling to provide growers and land managers with information for land-use planning.

Additional information on proper soil sampling procedures can be obtained from the Extension agricultural educator or fertilizer fieldman in your county.

The authors—Robert L. Mahler, soil scientist, Moscow, and Terry A. Tindall, former Extension soil scientist, Twin Falls Research and Extension Center; both with the University of Idaho Department of Plant, Soil, and Entomological Sciences.

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Appendix F – Feeding Effects on Manure Nutrient Content

Effects of Diet and Feeding Management on Nutrient Content of Manure

Introduction

Accumulation of excess nutrients on the farm results in a whole-farm nutrient imbalance that can contribute to water and air pollution. A major portion of nutrients brought onto livestock and poultry farms comes from purchased feeds. Reducing nutrients or selecting more efficient feed nutrient sources and/or feeding techniques can significantly reduce the nutrient content of excreted manure (helping to achieve a whole farm nutrient balance), and help to reduce odors and other gaseous emissions from manure.

The U.S. Department of Agriculture (USDA) and the Environmental Protection Agency (EPA) released *Unified National Strategy for Animal Feeding Operations* in March 1999. Importantly, the Strategy articulated a national performance expectation that all animal feeding operations should develop and implement technically sound, economically feasible, and site-specific comprehensive nutrient management plans (CNMPs) to minimize potential adverse impacts on water quality and public health. Feed management is one component of a CNMP.

Proper management of animal diets is a valuable tool to help balance nutrient flows, to achieve a whole-farm nutrient balance, and to reduce the potential negative impacts some nutrients have on the environment.

This technical note describes a series of basic nutrition and feeding management principles and potential adjustments that can be made on livestock and poultry operations to reduce nutrient excretions. This technical note was prepared from material published by the Federation of Animal Science Societies (FASS), Savoy, Illinois (fass@assochn.org). Additional technical notes provide specific feeding management and nutrient excretion information for beef, dairy, poultry, and swine. These technical notes are not intended to be all-inclusive. Farmers or operators should consult with Extension personnel or qualified animal nutritionists for detailed information and thorough evaluations of the animal diets and feeding management programs for livestock or poultry operations.

Digestive processes

The digestive process begins with the intake of feed ingredients provided to meet animal maintenance, production, and reproduction requirements. The requirements for production are affected by stage of growth and the type of product (e.g., meat, milk, eggs) involved. How well the animal can retain nutrients for productive purposes depends upon the bioavailability of the nutrients in the diet, absorption, and metabolism. The quantity of nutrients excreted by animals is affected by three main factors:

- the amount of dietary nutrients consumed,
- the efficiency with which they are utilized by the animal for growth and other functions, and
- the amount of normal metabolic losses (endogenous). In other words, the amount of excreted nutrients can be expressed as:

Nutrients excreted = Nutrient intake - Nutrients utilized + Nutrients from endogenous sources

The primary way to reduce the amount of nutrients excreted by animals is to decrease the amount that is consumed and increase the efficiency of utilization of the dietary nutrients for formation of the product.

The goal of efficient and productive feeding of animals, within economic and environmental constraints, is to provide essential available nutrients for maintenance and production with minimal excess amounts.

Nutrients in feeds can vary considerably, and not all nutrients in feeds are available to the animal. Therefore, any means of increasing the digestibility or availability of nutrients will increase the potential for animal use and retention and reduce the amount of nutrients excreted. There is increasing interest today in using enzymes, genetically modified feed ingredients, and feed-processing technologies to enhance the availability of nutrients so as to meet the specific animal needs and reduce excretion of nutrients. In addition, a routine feed analysis program is imperative so that diets can be formulated and periodically adjusted to meet, but not exceed, the nutrient requirements of the animal.

Ruminants and nonruminants have different digestive systems. The ruminant (cattle and sheep) is capable of digesting and utilizing nutrients and energy from forages as well as from the easily digestible grains (concentrates). The nonruminant (poultry and swine) cannot effectively use a large amount of forages (fiber). Also, poultry and swine cannot digest some of the nutrients, particularly phytate phosphorus (P) contained in grains. Usually, 50 percent of the P in the grains and oilseeds is in the form of phytate, which is not available to swine and poultry. Therefore, to meet their P requirements, their diets must include additional P, generally supplied by mineral supplements. The combination of the P in feed grains and the additional mineral P added to the diet increases the total P consumed by the animal. A considerable portion of the nonavailable P and/or extra P not needed by the animal is excreted. If the diet contains an enzyme called phytase, which will release the phytate form of phosphorus from the grains, then supplemental phosphorus in the diets can be reduced.

Following are some factors that should be considered for making adjustments in the diet or feeding program to reduce anticipated excretion of nutrients and manure volume. In all cases, nutrients should be managed to meet the animal needs and, of equal importance, to minimize nutrient excesses.

Feed management factors

Recommended feed management practices for a particular operation may include implementation of grouping strategies, including grouping by gender and increasing the number of production groups; appropriately adjusting diets based on climatic factors; minimizing feed wastage; and employing processing options to improve feed use efficiency. Further information is provided in the species-specific technical notes.

Grouping. (1) Place animals of similar ages, weights, and/or production levels together. (2) Place animals of the same gender together. Split-sex feeding divides the animals by gender so that diets can be formulated to meet the special nutrient needs of each sex.

Climate. Adjust diet to meet specific climate conditions (e.g., temperature, wind, precipitation), or adjust the building climate to optimize nutrient utilization.

Phase feeding. Use multi-phase feeding versus minimal-phase feeding. Phase feeding provides a series of diets that are formulated to more closely meet the nutrient needs of the animal at a particular stage of growth or production. Dividing the growth period into several periods with a smaller spread in body weight allows producers to provide diets that more closely meet the animal's nutrient requirements.

Wastage. Minimize feed and water spillage.

Processing. Pelleting, extrusion, steaming, micronization, ensiling, and reducing particle size increase the digestibility of diets for swine and poultry. Processing feeds (e.g., grinding, pelleting, and fermenting) releases

nutrients in the diet so the animal can absorb and retain more nutrients and excrete less nutrients and manure volume. Processing is not as critical for ruminants; however, coarse grinding, ensiling, and steaming have been effective for ruminants.

Diet manipulation factors

Diet considerations that are described in more detail in the technical notes on individual species include formulation based on feed available nutrients, the use of growth promotants to improve feed use efficiency, consideration of genetic factors that influence nutrient needs, use of specialty feeds, and consideration of nutrient intake from water supplies.

Available nutrients. Know the availability of nutrients in feed ingredients and formulate diets based upon available nutrients in the feed ingredients. Nutritionists should use the respective National Research Council (NRC) nutrient requirements for each farm animal as a guide to formulating diets unless data are available on the farm showing nutrient requirements of a specific genetic line of animals.

Nutrient levels. Some nutrient levels in commercial animal diets may be excessive. Chemical analyses of ingredients and reformulation are critical to minimizing excesses.

Genetics. Know the genetic capability of the animal, including feed intakes and responses to environmental conditions (e.g., climate, disease pressure, housing system).

Growth promoters. Antibiotics and other growth promoters increase feed efficiency. Growth promoters reduce nutrient excretion by increasing nutrient utilization.

Specialty feeds. Providing specific feed ingredients (e.g., high-oil corn, nutrient-dense corn, low-phytate corn, and soybeans) helps achieve a proper balance or increased availability of nutrients. Some of these are not commercially available today, but may be so in the near future.

Water supplies. Water supply sources can contribute significantly to mineral intakes.

Supplemental phosphorus. Reduce supplemental P and add phytase to swine and poultry diets to reduce P excretion. Remove all supplemental P in beef cattle diets and most of the supplemental P in dairy cattle diets to reduce P excretion.

Crude protein. Reduce dietary protein content and add synthetic amino acids to swine and poultry diets; reduce protein and select nitrogen (N) sources that cattle can absorb more effectively.

Benefits of reducing nutrients

Reducing the nutrient content of farm animal manure has the following benefits:

- A smaller land base per animal unit is required for manure application. This may provide a means to balance nutrients on a whole-farm basis.
- Greater volumes of manure can be applied per acre of land to meet agronomic rates for crop production. This may result in less labor and fuel costs for land application and reduce the potential need to supplement crop nutrient budgets with commercial fertilizer. Applying greater amounts of organic matter from manure per acre could result in more carbon sequestration and reduced emissions of gases responsible for global warming.

- Reduced N and sulfur excretion have the potential to reduce odors. Reduced volumes of manure production will reduce the requirement for manure storage capacity and increase the flexibility for timing of manure application to cropland.

Dietary adjustments

The table on page 4 provides potential reductions in the excretion of nutrients with the dietary and/or feeding management adjustments mentioned above for livestock and poultry on operations that have not yet adopted diet and/or feeding management strategies to reduce manure nutrient content. It should be noted, however, that these potential effects are not additive. For more specific information, see the FASS fact sheets and the NRCS technical notes in this series for the specific animal species.

Potential reductions in the excretion of nutrients

Strategy	Nitrogen reduction (%)	Phosphorus reduction (%)
Formulate diet closer to requirement	10-15 (nonruminants) 10-25 (ruminants)	10-15 (nonruminants) 10-30 (ruminants)
Reduced protein/AA supplementation (nonruminants)	10-25 (poultry) 20-40 (swine)	n/a ¹
Protein manipulation (ruminants)	15-25	n/a ¹
Use of highly digestible feeds	5	5
Use of phytase/low P (nonruminants)	2-5	20-30
Selected enzymes	5	5
Growth promotants	5	5
Phase feeding	5-10	5-10
Split-sex feeding	5-8	n/a ¹

¹ Not applicable.

Table data adapted from Federation of Animal Science Societies (FASS) publication, *Dietary Adjustments to Minimize Nutrient Excretion from Livestock and Poultry*, January 2001.

Glossary terms used in the series of nutrient management technical notes

Available nutrient basis. Formulating a diet based on the bioavailability of the nutrients from the feed ingredients in the diet for the intended production purposes.

Bacterial protein (BCP). The crude protein in rumen bacteria made up of amino acids and nucleic acids.

Barrow. Male castrate of swine.

Bioavailability of nutrients. The amount of nutrient in the diet that is released in the digestion process and that can be absorbed in a form that can be used in the body for normal metabolic functions of the nutrient.

Bovine growth hormone. A natural nonsteroidal protein hormone produced in the pituitary glands of cattle that helps cows produce milk. The growth hormone produced in cattle will only be effective in cattle. This protein has been produced synthetically in bacteria.

Broiler. Chicken produced for meat.

By-products. Feed ingredients from sources that are normally waste products from other industries.

Concentrates. Plant materials (feeds) that contain relatively high starch content.

Crude protein. A measure of dietary protein that is based on the assumption that the average amino acid in a protein contains 16 percent nitrogen. Thus, total chemically determined nitrogen $\times 6.25$ ($100 / 16$) = crude protein.

Crystalline amino acid. Amino acid produced in its pure chemical form.

Cystine. A sulfur-containing amino acid that can replace up to one-half of the methionine requirement.

Degradable intake protein (DIP). Crude protein that is degraded in the rumen by micro-organisms.

Denitrification. The process by which nitrogen is converted to nitrogen gas (N_2) and nitrous oxide (N_2O) and returned to the atmosphere.

Diet formulation. The process of combining an assortment of feed ingredients into a diet that will meet the nutrient and energy requirements of the animal for the intended purpose for which the animal is produced.

Digestibility. The relative amount of nutrients released from the digestion process.

Digestion. The process of breaking down nutrients through chewing and the action of enzymes to release nutrients that can be absorbed in animals.

Dry-matter intake. The amount of completely dry feed consumed by animals.

Dry precipitation. Chemicals combining in the atmosphere and falling to Earth.

Endogenous. Nutrients within the animal that may be produced or synthesized. Excretion of endogenous nutrients may occur from the recycling of nutrients and normal cellular metabolic processes.

Endogenous phytase. The enzyme naturally derived within the animal or from microbial sources within the animal that degrades phytate and releases phosphorus.

Feed use efficiency. The amount of live weight gain, milk production, or egg production per unit of feed consumed.

Fermentation by-products. By-products that have been processed by anaerobic fermentation.

Fermented feeds. Feeds that have been processed and preserved by anaerobic fermentation. A typical example is the acid fermentation of whole corn plant silage.

Forage. Plant material that contains relatively high fiber content.

Gilt. A term used to describe young female swine before sexual maturity.

Grass tetany. A nutritional disease caused by inadequate magnesium in the blood. It most commonly occurs among lactating animals grazing on rapidly growing, lush spring pastures containing less than 0.2 percent magnesium and more than 3 percent potassium and 4 percent nitrogen.

Ideal protein basis. Formulating a diet based on the concept that the protein content of the diet has a balance of amino acids that exactly meets the animal's amino acid requirements.

Layer. A chicken raised to produce eggs.

Leaching. The process by which plant nutrients move down through the soil profile, potentially reaching ground

water.

Lysine. A basic amino acid required for growth.

Metabolizable protein (MP). Protein (amino acids) absorbed from the small intestine of ruminants. Contains bacterial protein and undegraded intake protein.

Methionine. A sulfur-containing amino acid required for growth.

Microbial protein synthesis. The process by which protein is synthesized in the rumen as micro-organisms grow and multiply.

Near infrared spectroscopy. Feed analysis performed using near infrared light wave reflectance.

Nonruminant (monogastric). An animal that has a simple stomach (one compartment) and must utilize concentrate diets.

Phase feeding. Changing the nutrient concentrations in a series of diets formulated to meet an animal's nutrient requirements more precisely at a particular stage of growth or production.

Phytase. An enzyme that degrades phytate, making phosphorus available to nonruminants.

Phytate phosphorus. A complex, organic form of phosphorus that is bound to the phytate molecule and is not readily digested by nonruminant animals.

Precision nutrition. Providing the animal with the correct ratio and quantity of nutrients in a diet at the ideal ratio to most efficiently produce the end product for which the animal is raised.

Ruminant. An animal capable of digesting forages (roughages) because it has a large stomach with four compartments that have micro-organisms present.

Somatotropin. The hormone that regulates growth, affects the metabolism of all classes of nutrients, stimulates milk production, and improves productive efficiency.

Sparing effect. The process whereby one chemical or metabolite reduces the need or requirements for another nutrient.

Split sex feeding. A feeding and housing program that divides animals by gender and formulates diets to meet the specific nutrient requirements of each sex more precisely.

Total digestible nutrients (TDN). Total of all the nutrients in the diet that are available to the animal.

Undegraded intake protein (UIP). Feed protein that is not degraded in the rumen by micro-organisms.

Volatilization. The process by which chemicals evaporate at ordinary temperatures.

Wet-chemistry procedures. Analysis of nutrients using standard, approved laboratory procedures.

Wet-dry feeding systems. Feeding systems designed to introduce water with dry feeds, either at prescribed times or at any time on demand by the animal. By introducing water at the time of feeding, the potential for water spillage and dust from feed sources is reduced.

Feed and Animal Management for Beef Cattle

Introduction

Beef cattle feeding operations typically include weaned calves and backgrounded and stocker cattle that are fed to an optimum beef grade. For short periods, beef cows may be fed in confined feedlots. Distinctly different diets, generally differing in the amount of roughage relative to concentrate levels, are fed during different stages of growth or reproduction. This results in great differences in the volumes of manure produced and the nutrient compositions of those manures at the different life stages. This technical note briefly highlights some factors affecting nutrient excretion, along with potential dietary adjustments that can minimize excess nutrient excretion.

A critical part of feed management is to accurately formulate diets and manage the feeding of them so the nutrients fed consistently match the nutrients needed at each stage and rate of growth. For example, table 1 shows how the amount of nutrients needed daily changes with stage of growth and rate of gain for growing cattle. Table 2 illustrates how daily nutrients needed by beef cows change by stage of the reproductive cycle. These tables are only examples to illustrate how the diet formula needs to be specific for each feeding situation. The concentration of nutrients needed in the diet for a particular pen of animals changes with the mature size, level of production, and dry matter intake.

Diet formulation

Diets should be formulated and updated regularly to avoid the overfeeding of nutrients or fluctuations in performance. The most common standard for diet formulation is the National Research Council's (NRC) publication, *Nutrient Requirements of Beef Cattle*, 1996. This publication provides equations to compute nutrient requirements for any mature size and growth rate. Therefore, actual dry matter intakes and a computer program that includes NRC's and/or other research-based equations are needed to accurately predict how nutrient requirements should be used to formulate diets. Because of the complexity of formulating diets to optimize production while minimizing excretion, producers not trained in nutrition should seek help from qualified nutritionists.

Diets fed to cattle may contain excess nutrients as a safety factor to minimize poor growth or performance because of variation of nutrients in feed sources and performance variation in the cattle. By properly balancing protein, phosphorus (P), and the other nutrients in the diet to meet animal performance expectations, excretion of unnecessary excess nutrients can be minimized, reducing their potential to contribute to environmental degradation, particularly to water quality.

Table 1 Protein, calcium, and phosphorus requirements for growing and finishing beef cattle ¹

Body weight, lb =	525	650	775	900	1,025
Dry matter intake, lb/d =	14	17	19.5	21.5	23.5

Daily gain, lb Crude protein, lb/d

1.0 1.22 1.36 1.49 1.57 1.65
1.8 1.55 1.69 1.82 1.86 1.91
2.5 1.87 2.01 2.13 2.14 2.15
3.3 2.18 2.32 2.43 2.40 2.38
4.0 2.49 2.62 2.73 2.66 2.60

Calcium, lb/d

1.0 0.04 0.04 0.05 0.05 0.05
 1.8 0.06 0.06 0.06 0.06 0.06
 2.5 0.08 0.08 0.08 0.07 0.07
 3.3 0.10 0.09 0.09 0.09 0.08
 4.0 0.11 0.11 0.10 0.10 0.09

Phosphorus, lb/d

1.0 0.02 0.02 0.03 0.03 0.03
 1.8 0.03 0.03 0.03 0.03 0.04
 2.5 0.04 0.04 0.04 0.04 0.04
 3.3 0.04 0.04 0.04 0.05 0.05
 4.0 0.05 0.05 0.05 0.05 0.05

¹ Weight at small marbling=1,200 pounds. Adapted from table 9-1 with modifications, Nutrient Requirements of Beef Cattle, 7th Ed., 1996, National Research Council, National Academy Press, 2101 Constitution Ave., Washington, DC 20418 (J.G. Buchanan-Smith, Chair, Subcommittee on Beef Cattle Nutrition).

Table 2 Protein, calcium, and phosphorus requirements for beef cows ¹

Months since calving	Body weight (lb)	Dry matter intake (lb/d)	Crude protein (lb/d)	Calcium (lb/d)	Phosphorus (lb/d)
0 (calving)	1,340	24.6	2.20	0.06	0.04
1	1,200	26.8	2.71	0.08	0.05
2 (peak milk)	1,200	27.8	2.97	0.09	0.06
3	1,205	28.4	2.82	0.08	0.06
4	1,205	27.4	2.54	0.07	0.05
5	1,205	26.5	2.26	0.06	0.04
6	1,210	25.7	2.04	0.06	0.04
7 (weaning)	1,215	24.2	1.45	0.04	0.03
8	1,225	24.1	1.49	0.04	0.03
9	1,240	24.0	1.57	0.04	0.03
10	1,260	23.9	1.69	0.06	0.04
11	1,290	24.1	1.89	0.08	0.04

¹ Mature weight at body condition 5=1,200 pounds, peak milk=20 pounds, calf birth weight=86 pounds, calving interval=12 months. Adapted from table 9-7 with modifications, Nutrient Requirements for Beef Cattle, 7th Ed., 1996, National Research Council, National Academy of Sciences, National Academy Press, 2101 Constitution Ave., Washington, DC 20418 (J.G. Buchanan-Smith, Chair, Subcommittee on Beef Cattle Nutrition).

Routine feed analyses, especially when a new source of feed is used, are critical for proper diet formulation and reduction in nutrient excretion. The moisture content of feed ingredients, especially silage and wet by-products, should be checked frequently to produce formulations that accurately reflect the nutrient content of available feeds.

Feeding cattle using the metabolizable protein system as described by the NRC rather than crude protein is one way to better characterize rumen and lower digestive tract nutritional needs. Selecting and balancing the right type of protein sources are important to meeting the amino acid needs of the animal and for minimizing excretion. Because by-products are often utilized in cattle diets, one should note the digestibility (availability) of nutrients from each feed ingredient source as well as significant nutrient excesses. The content and availability of amino acids from different protein sources varies considerably, leading to inadvertent overfeeding of some amino acids that then contribute to nitrogen (N) excretion. Some estimates are that selecting optimal levels of the right type of protein to more accurately match animal requirements can reduce N excretion by as much as 25 percent.

Balancing nutrient levels can be challenging when by-products are used. An important feed source for the beef industry, by-product feeds include roughages and concentrates other than the primary products of plant and animal production, and by-products from industrial manufacturing. Examples include grain stover and fermentation by-products. The availability and levels of N and P are especially important. In addition, fermentation by-products used as energy or protein sources may increase P excretion. Therefore, more intensive management of manure storage, treatment, and utilization may be required.

In addition, P is routinely added into mineral mixes for cattle. However, the normal level of P in most typical

ingredients in cattle rations exceeds their P requirements. Recent research has shown that P excretion can be reduced by 20 to 30 percent by not adding supplemental P to the diet. One notable exception is forage-based diets, especially when forage quality is poor. In this case there may be a need to add supplemental P to the diet to meet some cattle requirements.

The dietary salt intake level should be reduced in cattle feeds in semiarid and arid climates, where salinity problems can exist and sodium accumulation can adversely affect crop production. In addition, beware of potassium accumulation in forages receiving high levels of manure application. This can potentially cause grass tetany problems with cattle consuming such forages.

Phase feeding and grouping strategies may also be used to meet more nearly the nutritional needs of cattle of a common age, size, and sex. Uniform groups (by stage of growth) allow the producer to use diets that come closer to the actual needs of all the individual animals in the group since there is less variation among animals.

Overfeeding of nutrients within a group can be significantly reduced. Dividing the growth period of the cattle into several periods with a smaller spread in body weight allows producers to provide diets that more closely meet the cattle's nutrient requirements. This approach may reduce N and P excretion by at least 5 to 10 percent.

Nutrient value of water. The mineral content of the water supply should be considered with regard to the total intake of dietary minerals. Depending on the quality of water supply available, water intake may substantially contribute to daily mineral intake, particularly with regard to sulfur, and in some areas of the country, salt. Routine water sampling can help the nutritionist formulate properly the amount of minerals to add to the diet to meet the animal's actual requirements.

Feed management

Feed bunk management. Good bunk management is imperative to reduce feed wastage. This involves checking feed intake levels and adjusting intake to closely meet the requirements of the size of the cattle involved. Consideration should also be given to how much feed is being wasted in the feedlot operation. In some cases refused feed is scraped from the feeding area and is not re-fed. In this situation waste removed from the lot includes the wasted feed and the manure nutrients.

Feed storage. Another aspect of feed management considers nutrient losses during feed storage. Depending upon how feed ingredients are stored, nutrients may be directly lost to the environment as a result of poor feed storage conditions or of rainfall on uncovered feed.

Fermented feeds, such as silage, can produce a leachate. Containment of silage leachate and good management of all feed storage areas and feed transport are advised so that feed-based nutrients are not lost directly to the environment.

Summary

The National Research Council's *Nutrient Requirements for Beef Cattle* (1996) provides equations, tables, and guidelines for evaluating all beef cattle diets, including the breeding herd. Also, consult qualified nutritionists to accurately evaluate current or planned diet compositions. Consider feed management alternatives during the development of Conservation Plans, especially during the development of Comprehensive Nutrient Management Plans (CNMPs).

Varies feed management practices can impact the nutrient content of excreted beef cattle manure. Table 3 summarizes the potential for various activities to impact nutrients in beef cattle manure.

The actual impact of a feed management strategy or strategies on a beef operation can only be determined by analysis of the manure after the strategy has been implemented. During the development of CNMPs, the potential impact of such strategies can be estimated using values in table 3. In using data from this table, planners are encouraged to be conservative in their selection of factors. Also, it is important to remember that the impact of using multiple strategies in a single diet is not likely to be additive for each single strategy being used. Rather, it is more likely to be something greater than the value for the strategy with the smallest impact, but less than the sum of the values for all the individual strategies being used. During the development of CNMPs, it is better to underestimate the potential impact of feed management than to overestimate it. Later, the plan can be modified based upon data accumulated from the actual production operation.

Table 3 Potential for feed management to impact nutrients in beef cattle manure¹

Strategy	Nitrogen reduction (%)	Phosphorus reduction (%)
Minimize dietary nutrient excesses	0-25	0-30
Protein manipulation	0-25	n/a ²
Growth promotants	5	5
Phase feeding	5-10	5-10

¹ Table adapted from Federation of Animal Science Societies (FASS) publication, *Dietary Adjustments to Minimize Nutrient Excretion from Livestock and Poultry*, January 2001.

² Not applicable.

Glossary

By-products. Feed ingredients from sources that are normally waste products from other industries.

Crude protein. A measure of dietary protein that is based on the assumption that the average amino acid in a protein contains 16 percent nitrogen. Thus, total chemically determined nitrogen x 6.25 (100 / 16) = crude protein.

Fermentation by-products. By-products that have been processed by anaerobic fermentation.

Fermented feeds. Feeds that have been processed and preserved by anaerobic fermentation. A typical example is acid fermentation of whole corn plant silage.

Grass tetany. A nutritional disease caused by inadequate magnesium in the blood. It most commonly occurs among lactating animals grazing on rapidly growing, lush spring pastures containing less than 0.2 percent magnesium and more than 3 percent potassium and 4 percent nitrogen (25% protein).

Metabolizable protein. Protein (amino acids) absorbed from the small intestine of ruminants. It

contains bacterial protein and undegraded intake protein.

Phase feeding. Changing the nutrient concentrations in a series of diets formulated to meet an animal's nutrient requirements more precisely at a particular stage of growth or production.

Ruminant. An animal capable of digesting forages (roughages) because it has a large stomach with four compartments that have micro-organisms present.

Feed and Animal Management for Dairy Cattle

Introduction

Dairy operations typically include the milking cow herd with some of the cow population in the nonlactation stage (dry cows). Operations may or may not include growing heifers being raised as replacements for the milking herd. Distinctly different diets are required for each of the three production cycle stages, resulting in great differences in the volume and nutrient compositions of manure. This technical note briefly highlights some factors that affect nutrients in manure from dairy cattle and modifications in the diet that can be used to reduce them.

A critical part of feed management is to accurately formulate diets and manage the feeding so that the nutrients fed consistently match the nutrients needed by each group in the herd. For example, table 1 shows how the concentration of nutrients needed in the diet change with stage of the life cycle and level of milk production. This table is an example to illustrate how the diet formula needs to be specific for each group in the herd. The concentration of nutrients needed in the diet for a particular level of production changes with dry matter intake.

Diet formulation

Diets should be formulated and updated regularly to avoid overfeeding of nutrients or fluctuations in milk production. The most common guideline for diet formulation is the National Research Council's (NRC) publication, *Nutrient Requirements of Dairy Cattle*, 2001. This publication provides equations to compute nutrient requirements for any size cow and milk production level and any stage of the life cycle. Therefore, actual dry matter intakes and a computer program that includes NRC and/or other researchbased equations should be used to formulate diets. Because of the complexity of formulating diets to optimize production while minimizing excretion, producers not trained in nutrition should obtain help from qualified nutritionists when formulating diets. Proper diet formulation requires routine (monthly or quarterly) forage and by-product analysis because these ingredients are highly variable. Tabular values and previous sample analyses are not reliable for determining the nutrient content of these feed ingredients. Conducting a routine moisture analysis is important to adjust and mix feeds to ensure delivery of the formulated diet to the cattle. Cows should be evaluated for their body condition routinely so that the proper energy level of the diet can be determined.

A 50 percent variation in manure production might result from differences in feed wastage, ration formulation, type of feeding program (e.g., dry lot versus pasture feeding), and/or animal grouping systems.

Since dairy cattle are ruminants, they can utilize forages (generally lower in digestibility) as well as concentrates (generally higher in digestibility) in their diets. Depending upon the stage of production, the roughage-to-concentrate ratio can vary tremendously. As a result, volumes of manure produced are much greater when poorly digestible forages (fiber) are fed as compared to concentrates. In addition, the availability of nutrients in forages can vary considerably with different forage species and stage of maturity. Also, the composition of the manure is significantly different with these different scenarios.

Studies have shown that selecting the right type of protein sources in the diet to meet animal requirements can reduce nitrogen (N) excretion by 15 to 25 percent. Most of the N consumed by cattle is a part of the protein the animal consumes. When cows consume excess protein, an increased amount of N is excreted in the urine as urea. Small amounts of urea can also be diffused into the milk. The concentration of urea in milk is proportional to the amount of N excreted in urine for cows with a given body weight. Cows consuming excess protein typically have higher milk urea nitrogen (MUN) concentration than cows consuming protein at or below their requirements. MUN can be measured for use as an indicator of excess protein in the diet. A general rule is that an average herd MUN should fall between 9 and 14 mg/decaliter of milk. The current recommendation from the NRC (2001) for phosphorus (P) feeding is a range of about 0.32 to 0.42 percent of dietary dry matter content, depending upon level of milk production and stage of lactation. Yet many producers are feeding closer to 0.5 percent for all lactating cows. Farmers often overfeed P with the thought that (1) they will improve reproductive efficiency, and (2) the feed ingredient tables typically underestimate the amount of P in most ingredients.

Mineral P supplements, such as dicalcium phosphate or monocalcium phosphate, are added to dairy cow diets at levels exceeding recommendations to provide a safety margin, especially if reproductive problems are suspected. As a result, diets typically contain 25 to 35 percent more P than is recommended by the NRC. By reducing or removing all supplemental P in the dairy diet, P excretion in manure can be reduced by as much as 30 percent.

Table 1 Selected nutrient requirements of dairy cattle (as determined by sample diets) ¹

Holstein, 1,500 lb cow, avg. body condition, 65 months of age	-----Stage of production-----								Dry, preg. 270 days in gestation	660 lb heifer @ 1.91 lb gain/day
Milk yield, lb/d =	-----early lactation-----		-----90 days in milk-----							
	55	77	55	77	99	120				
Dry matter intake, lb/d	29.7	34.3	44.7	51.9	59.2	66	30.1	15.6		
Net energy, Mcal/lb	0.94	1.01	0.62	0.67	0.70	0.73	0.48	1.03		
Diet, % RDP	10.5	10.5	9.5	9.7	9.8	9.8	8.7	9.4		
Diet, % RUP	7	9	4.6	5.5	6.2	6.9	2.1	2.9		
Crude protein, % ²	17.5	19.5	14.1	15.2	16.0	16.7	10.8	12.3		
NDF, min %	25-33	25-33	25-33	25-33	25-33	25-33	33	30-33		
NFC, max %	36-44	36-44	36-44	36-44	36-44	36-44	42	34-38		
Calcium, %	0.74	0.79	0.62	0.61	0.67	0.60	0.45	0.41		
Phosphorus, %	0.38	0.42	0.32	0.35	0.36	0.38	0.23	0.23		
Potassium, % ³	1.19	1.24	1.00	1.04	1.06	1.07	0.52	0.48		
Sodium, %	0.34	0.34	0.22	0.23	0.22	0.22	0.10	0.08		
Copper, mg/kg ⁴	16	16	11	11	11	11	13	10		
Zinc, mg/kg	65	73	43	48	55	65	22	27		

¹ Adapted from tables 14-7, 14-8, 14-9, and 14-16, Nutrition Requirements of Dairy Cattle, 7th revised edition, 2001, National Research Council (NRC),

National Academy of Sciences, National Academy Press, 2101 Constitution Ave., Washington, DC 20418 (J.H. Clark, chair, Subcommittee on Dairy Nutrition).

² Equivalent to the sum of rumen degradable protein (RDP) and rumen undegradable protein (RUP) only when they are perfectly balanced.

³ Heat stress may increase the need for potassium.

⁴ High dietary molybdenum, sulfur, and iron can interfere with copper absorption, increasing the requirement.

Overfeeding P for reproductive performance has no scientific basis. Research shows that using accurate requirements for P along with actual feed analysis to formulate diets optimizes animal performance and minimizes P concentration in manure. Forages in particular are highly variable in P content and should be determined for each farm, using wet-chemistry procedures.

By-products (e.g., products of the brewing and distilling industries) are often utilized in cattle diets. Balancing the proper nutrient levels in cattle diets can be challenging when by-products are used. A consideration in the use of by-products is that the concentration and availability of nutrients, especially N and P, from each feed ingredient source can vary greatly, causing significant variation in nutrient contents that can create excesses in the diet.

The dietary salt intake level should be reduced in cattle feeds in semiarid and arid climates where salinity problems can exist and sodium accumulation can adversely affect crop production. In addition, beware of potassium accumulation in forages receiving high levels of manure application. This can potentially cause grass tetany problems in cattle consuming such forages.

Production management

Several new technologies have the potential to reduce manure nutrients per 100 pounds of milk produced. Average responses from some research studies are used in this technical note. Actual responses vary from farm to farm and from group to group within a farm. One such technology is the manipulation of photoperiod by providing artificial lighting. It has been shown that increasing day length can increase milk production in dairy cattle by up to 8 percent. Nutrient intake required by such light-stimulated herds increased by only 4.1 percent, and N and P excretion increased by only 2.8 percent as compared with similar herds under natural day length.

Penning and grouping dairy cattle of similar milk production levels or stage of lactation and formulating diets to meet more nearly the nutritional needs of cattle reduce feed nutrient wastage. Uniform groups (by weight and stage of production) allow the producer to use diets that more closely match the actual needs of all animals in the group since there is less variation among animals, and overfeeding of nutrients can be minimized.

Dividing the milk production cycle into several periods with less variation in milk production within the group allows producers to provide diets that more closely meet the cattle's nutrient requirements. Use of phase feeding has been estimated to reduce N and P excretion by at least 5 to 10 percent.

Another new technology that may impact nutrient utilization and excretion is the administration of bovine growth hormone (BGH), or somatotropin. This peptide hormone can increase milk

production by as much as 30 percent in certain cows within the herd, although the entire herd's production would increase by only 14 percent. The nutrient requirements of a herd treated with BGH may increase by about 7 to 8 percent, and manure P may increase by 5 percent. However, the nutrient losses from the farm per unit of milk produced would, therefore, decrease by 8 to 10 percent per unit of milk produced.

Milking three times instead of twice per day can increase production per cow by an average of 11 percent and reduce stress on a herd. This increase in production results in the consumption of 5 percent more protein, with 3.5 percent more nutrients excreted in manure. The extra milking per day reduces the amount of nutrient excreted in manure by 7 percent per unit of milk.

Feed management

Feed bunk management. Good bunk management is imperative to reduce feed wastage. This involves checking feed intake levels for each group in the herd and adjusting intake to that required for the production level of each group. Consideration should also be given to how much feed is being wasted. In some operations leftovers are scraped up from lactating cows and re-fed to nonlactating cattle. In other cases refused feed is scraped from the feeding area and discarded. In this situation waste removed from the lot includes wasted feed and manure nutrients that need to be applied to the land.

Feed storage. Proper feed storage is necessary to preserve the nutrient value of the feed and to reduce direct loss of nutrients to the environment. Nutrients in water can come from leachate from fermented feeds (such as silage) and from runoff from feeds exposed to rain. Containment of silage leachate and good management of all feed storage areas are advised so that feed-based nutrients are not lost directly to the environment.

Nutritional value of water. The mineral content of the water supply should be considered with regard to the total intake of dietary minerals. Depending on the quality of water supply available, water intake may make a substantial contribution to daily mineral intake, particularly with regard to sulfur and, in some areas of the country, salt. Routine water sampling can help the nutritionist formulate properly for the amount of minerals to add to the diet to meet the animal's actual requirements.

Summary

The NRC publication *Nutrient Requirements for Dairy Cattle*, 2001, is a key reference to evaluate dairy cattle diets on a commercial operation. Also consult qualified nutritionists to accurately evaluate current or planned diet compositions during the development of a conservation plan, particularly during the development of a Comprehensive Nutrient Management Plan (CNMP). Various feed management activities can impact the nutrient content of excreted dairy cattle manure. Table 2 lists the potential of various feed management strategies to decrease the N and/or P content of manure excreted by dairy animals.

The actual impact of a feed management strategy or strategies on a dairy operation can only be determined by analysis of the manure after the strategy has been implemented. During the development of CNMPs, the potential impact of such strategies can be estimated using values in table 2. In using data from this table, planners are encouraged to be conservative in their selection of factors. Also, it is important to remember that the impact of using multiple strategies in a single diet is not likely to be additive for each single strategy used. Rather, it is more likely to be something greater than the value for the strategy with the smallest impact, but less than the sum of the values for all the individual strategies used.

During the development of CNMPs, it is better to underestimate the potential impact of feed management than to overestimate it. Later, the plan can be modified based on data accumulated from the actual production operation.

Glossary

By-products. Feed ingredients from sources that are normally waste products of other industries.

Bovine growth hormone. A natural nonsteroidal protein hormone produced in the pituitary glands of cattle that helps cows produce milk. The growth hormone produced in cattle will only be effective in cattle. This protein has been produced synthetically in bacteria.

Concentrate. Plant materials (feeds) that contain relatively high starch content.

Diet formulation. The process of combining an assortment of feed ingredients into a diet that will meet the nutrient and energy requirements of the animal for the intended purpose for which the animal is produced.

Forage. Plant material that contains a relatively high fiber content.

Phase feeding. Changing the nutrient concentrations in a series of diets formulated to meet an animal's nutrient requirements more precisely at a particular stage of growth or production.

Somatotropin. The hormone that regulates growth, affects metabolism of all classes of nutrients, stimulates milk production, and improves efficiency.

Table 2 Potential for feed management to impact the nutrient content of dairy cattle manure ¹

Strategy	Nitrogen reduction %	Phosphorus reduction %
Minimize dietary nutrient excesses	10-15	10-30
Protein manipulation	15-25	n/a ²
Increase number of production groups	5-10	5-10

¹ Adapted from the Federation of Animal Science Societies (FASS) publication, *Dietary Adjustments to Minimize Nutrient Excretion from Livestock and Poultry*, January 2001.

² Not applicable.

Appendix G – Emergency Management Plan

Emergency Management Plan for 4-Bros. Dairy, Inc.

DO NOT enter confined spaces such as manure pits, silos, tank spreaders, covered manure storage area unless properly trained and utilizing approved safety equipment.

If manure or wastewater from any form of spill reaches surface waters, notify the Idaho Department of Environmental Quality & Idaho State Department of Agriculture immediately

Idaho DEQ – Statewide Phone: (888) 800-3480

Twin Falls Office: (208) 736-2190

ISDA – Statewide Phone: (208) 332-8500

If there is a spill or release of manure or wastewater follow these procedures:

Assess the spill

*Assess the spill and potential for it to reach surface waters. Is the spill headed for wells or other sensitive areas?

Stop the Source

- *Stop the source of the spill immediately
- *Shut down equipment and pumps, close valves etc.
- *Separate pipes to create air gap if necessary to stop manure flow

Contain the spill

- *Limit the area affected by creating dikes, or berms with soil, bales or hay/straw or similar material that is readily available
- *Transfer manure to another storage
- *Contact neighbors who have empty tanks to collect and haul material
- *Apply any collected manure/wastewater to crop fields at agronomic rates

Spills or leaks of manure spreader tanks

- *If a spreader tank begins malfunctioning, move away from ditches and surface waters.
- *If manure is spilled on the roadways, call the sheriff for traffic control and clean the spill

Spills with irrigation equipment

- *Keep hoses and pipes in good repair
- *Secure fittings and joints to prevent leaks.
- *Turn off pumps and equipment immediately if spills occur.
- *If irrigation water is being added to the manure, prevent potential for back siphoning.

Manure runoff after field applications

- *Cease applications
- *Assess if wastewater is reaching surface water
- *Use tillage equipment to divert flow of manure

Breach of an earthen manure storage

- *Stop the flow of manure into the storage
- *Use soil to dike or berm the area or create an emergency holding area outside the existing storage.
- *Pump to another storage.
- *Begin pumping to tank for land application.

Notify and comply with reporting requirements

- *Contact the County Highway District if a county drain must be blocked
- *Contact the Lincoln County Sheriff if a spill occurs on the roadways.

Maintain records of any spill of manure or wastewater.

Assess how and why the spill occurred and take preventative measures to reduce the risk of such events happening in the future. Communicate with all family and farm employees about prevention and emergency response procedures.

Post the following emergency numbers where they are easily accessible.

	Contact Information
	4-Bros Dairy Inc.
	425 North 250 West
	Shoshone, Idaho 83352
	(208) 886-7716
Primary Contact:	
Andrew Fitzgerald	
Cell: (208) 308-4716	
Secondary Contact:	
Jerome Fitzgerald	
Cell: (208) 308-3481	

<u>Lincoln County Agency Telephone Numbers</u>	<u>State Agency Telephone Numbers</u>
<p>Fire/Police/Medical Dispatch Emergency Phone..... 911 Non-Emergency Phone 311 / (208) 324-1911</p> <p>Shoshone City & Rural Fire Department Fire Chief: Casey Kelley Phone: (208- 570-3599</p> <p>Lincoln County Sheriff Department Sheriff: Rene Rodriquez Phone: (208) 886-2250</p> <p>Lincoln County EMS Director: Phone: (208) 544-7003</p> <p>Lincoln County Office of Emergency Management Emergency Manger: Payson Reese Phone: (208) 320-3931</p> <p>Shoshone Highway District Foreman: Mark Kime Phone: (208) 886-7515</p> <p>Big Wood Canal Company Manager: David Stevenson Phone: (208) 886-2331</p>	<p>Idaho State Department of Agriculture Mitch Vermeer: (208) 334-8500</p> <p>Idaho Department of Environmental Quality Boise Office: (888) 800-3480 Twin Falls Office /Water Quality Manager: Kiley Mulholland: (208) 736-2190</p> <p>South Central Public Health Twin Falls Office: (208) 737-5900</p> <p>Department of Water Resources State Office: (208) 287-4800 Twin Falls Office: (208) 736-3033</p>

Preventative Measures / Mitigation for 4-Bros Dairy Inc.

The preventative measures / mitigation listed below was built in 2017.

*Lagoons have been added to the dairy complex for more added storage for run-on and run-off to the dairy complex.

*A trench has been dug on the northside of the complex for controlling the run-on of the dairy.

The table below shows the calculated storage columns at full, 1 foot of freeboard, and 2 foot of freeboard.

Storage Volumes (cubic feet)			
Storage Structure	Full	1 ft. Freeboard	2 ft. Freeboard
Pantone 1 Runoff Pond	1,706,051	1,359,820	1,040,825
Pantone 2 Overflow Pond	542,463	453,370	369,562
Barn 4 North Evaporation Pond	471,974	378,523	288,587
Barn 1 Lagoon 2	1,55,516	1,401,351	1,251,918
Barn 2 East Lagoon 1	272,671	213,621	158,196
Barn 2 East Lagoon 2	696,591	594,472	496,648
Barn 3 East Lagoon 3	905,979	706,334	532,569

The Pantone 1 Runoff Pond is located northwest of the Four Brothers Dairy Complex. It will be used for runoff collection for the compost area to the east. The maximum depth of this pond is about 9 feet with an average depth of about 5 feet.

The Pantone 2 Overflow Pond is located northwest of the Four Brothers Dairy Complex. It will be used for overflow water from Barn 4 North Evaporation Pond. The maximum depth of this pond is about 8.5 feet with an average depth of 6 feet.

The Barn 4 Evaporation Pond is an existing pond originally approved by the Idaho State Department of Agriculture in December 10, 2009. The banks of this structure had been raised and a volume survey was conducted. The average depth is 5 feet.

Barn 1 Lagoon 2 is an existing pond. Lagoon was constructed between 1999 and 2003.

Barn 2 East Lagoon 1 is a newly constructed structure located on the east side of the facility. The average depth is 4.5 feet with a maximum depth of 8 feet.

Barn 2 East Lagoon 2 is a newly constructed structure located on the east side of the facility. The average depth is 6.5 feet with a maximum depth of 11 feet.

Barn 2 East Lagoon 3 is a newly constructed structure located on the east side of the facility. The average depth is 6.5 feet with a maximum depth of 10.5 feet.

A 4th Lagoon is currently being constructed near Barn 2.

On the north side of the facility is a berm that is used to divert run on away from the dairy. To aid in diverting run on from coming onto the dairy facility a trench/channel has been dug to divert run on back to the northwest away from the dairy facility.



Maps of 4-Bros Dairy Inc.





Appendix H – NRCS Soils Info



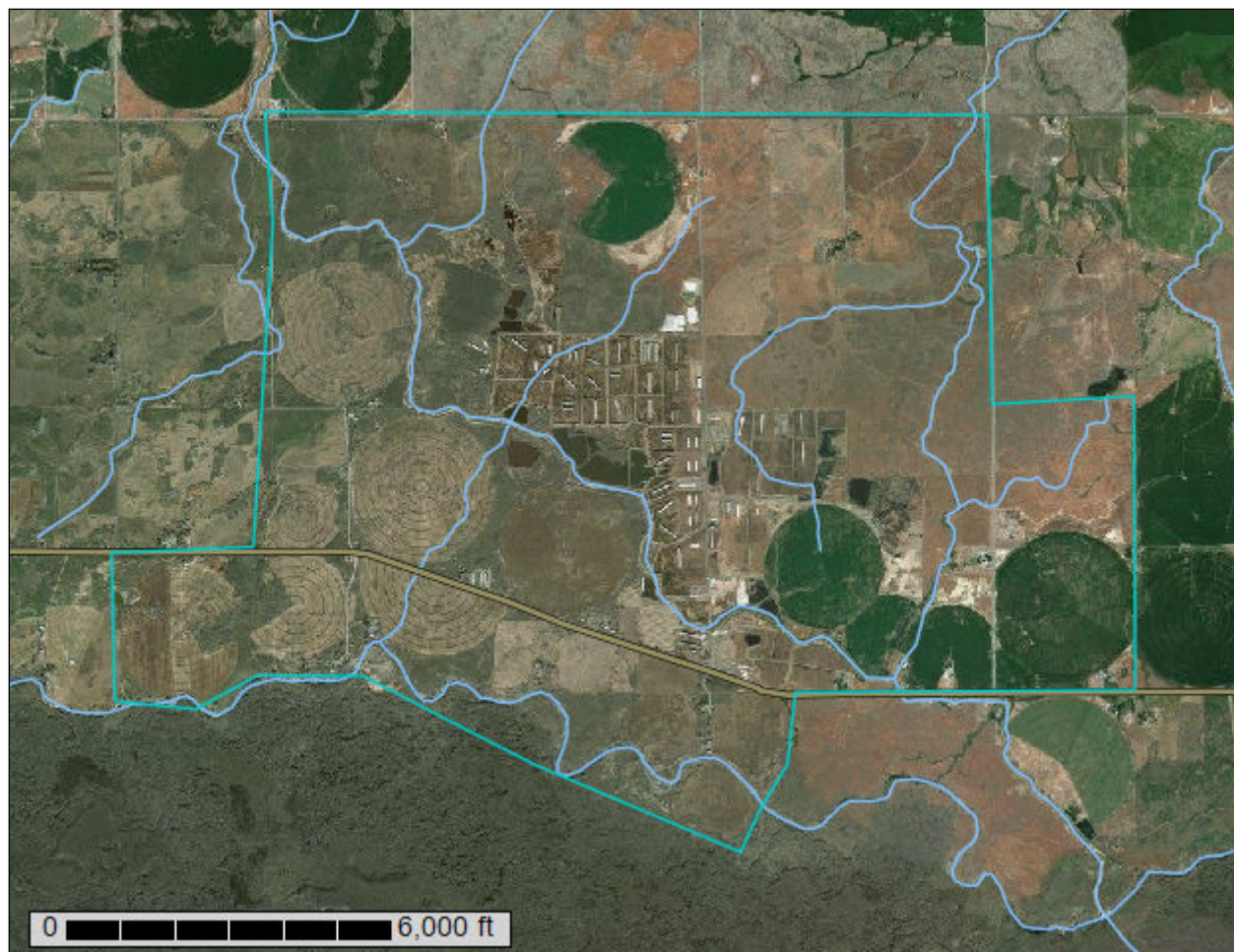
United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

Preface	2
How Soil Surveys Are Made	5
Soil Map	8
Soil Map.....	9
Legend.....	10
Map Unit Legend.....	11
Map Unit Descriptions.....	11
Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties.....	14
24—Burch-Quencheroo-Dryck complex, 0 to 2 percent slopes.....	14
26—Catchell silt loam, 3 to 6 percent slopes.....	16
27—Catchell-Gooding complex, 2 to 6 percent slopes.....	17
44—Dryck-Loupence complex, 0 to 1 percent slopes.....	19
46—Elijah-Bruncan complex, 1 to 4 percent slopes.....	20
47—Elijah-Gooding complex, 0 to 3 percent slopes.....	22
48—Elijah-McPan complex, 2 to 6 percent slopes.....	24
70—Gooding-Catchell complex, 1 to 3 percent slopes.....	26
74—Gooding-Power complex, 0 to 2 percent slopes.....	27
75—Haploxerolls-Camborthids-Rock outcrop complex, 1 to 3 percent slopes.....	29
106—Lava flows-Lithic Torriorthents complex, 2 to 8 percent slopes.....	31
147—Power silt loam, 0 to 3 percent slopes.....	32
151—Quencheroo-Loupence complex, 0 to 1 percent slopes.....	33
181—Starbuck-McPan-Rock outcrop complex, 2 to 20 percent slopes.....	35
215—Water.....	37
Soil Information for All Uses	38
Soil Reports.....	38
Soil Physical Properties.....	38
Physical Soil Properties.....	38
Water Features.....	54
Hydrologic Soil Group and Surface Runoff.....	54
References	57

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

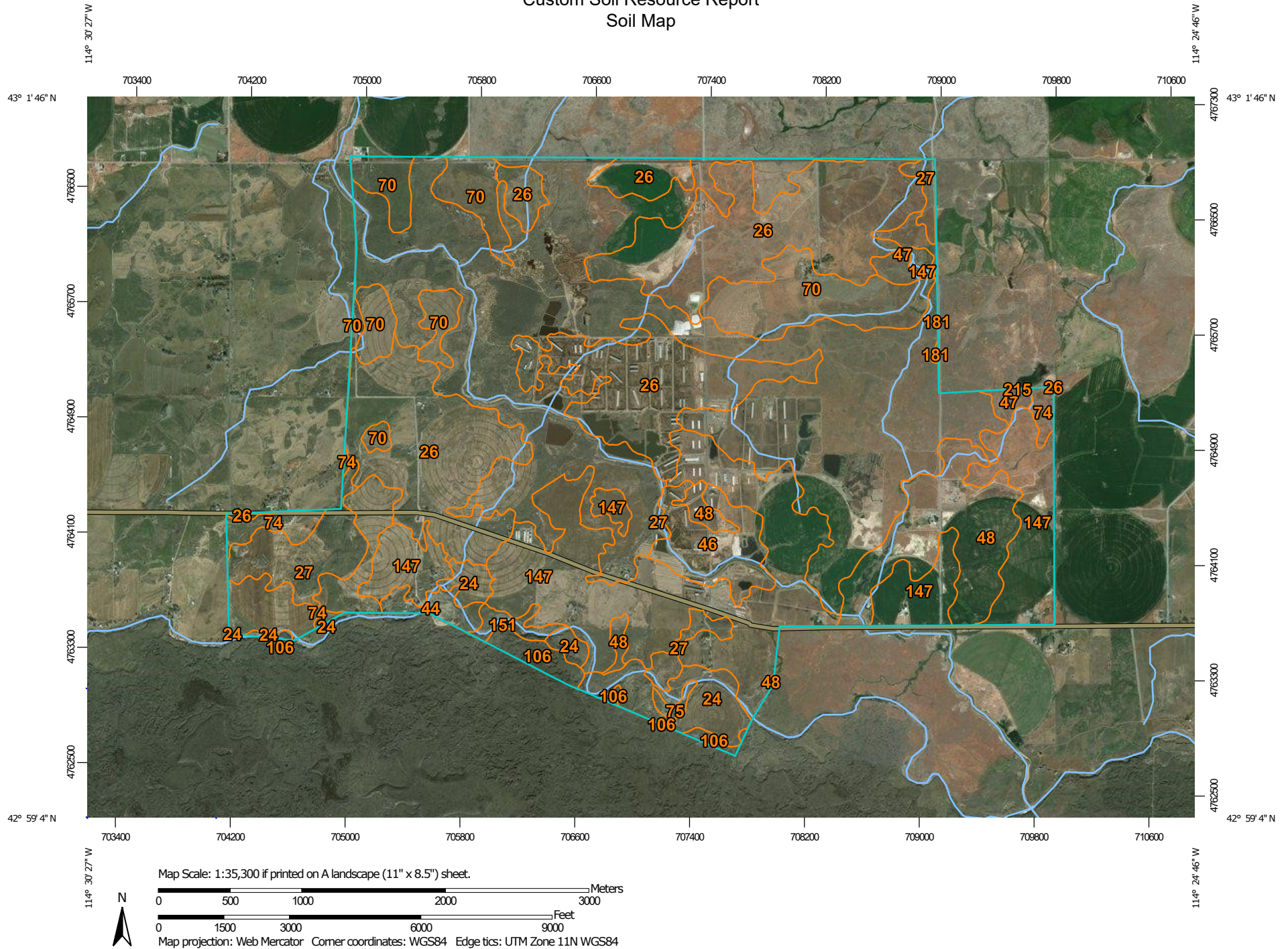
Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map




MAP LEGEND


Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit

 Clay Spot


 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water

 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot

 Sinkhole

 Slide or Slip

 Sodic Spot

 Spoil Area

 Stony Spot

 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

Water Features

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Wood River Area, Idaho, Gooding County and

Parts of Blaine, Lincoln, and Minidoka Counties

Survey Area Data: Version 17, Jun 4, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 14, 2012—Nov 8, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
24	Burch-Quencherroo-Dryck complex, 0 to 2 percent slopes	121.1	3.0%
26	Catchell silt loam, 3 to 6 percent slopes	894.8	22.0%
27	Catchell-Gooding complex, 2 to 6 percent slopes	1,430.5	35.2%
44	Dryck-Loupence complex, 0 to 1 percent slopes	27.5	0.7%
46	Elijah-Bruncan complex, 1 to 4 percent slopes	98.5	2.4%
47	Elijah-Gooding complex, 0 to 3 percent slopes	40.0	1.0%
48	Elijah-McPan complex, 2 to 6 percent slopes	218.6	5.4%
70	Gooding-Catchell complex, 1 to 3 percent slopes	287.9	7.1%
74	Gooding-Power complex, 0 to 2 percent slopes	143.6	3.5%
75	Haploxerolls-Camborthids-Rock outcrop complex, 1 to 3 percent slopes	7.8	0.2%
106	Lava flows-Lithic Torriorthents complex, 2 to 8 percent slopes	37.5	0.9%
147	Power silt loam, 0 to 3 percent slopes	733.9	18.1%
151	Quencherroo-Loupence complex, 0 to 1 percent slopes	19.0	0.5%
181	Starbuck-McPan-Rock outcrop complex, 2 to 20 percent slopes	1.3	0.0%
215	Water	0.1	0.0%
Totals for Area of Interest		4,062.1	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named

according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties

24—Burch-Quencheroo-Dryck complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2r8s

Elevation: 3,500 to 4,600 feet

Mean annual precipitation: 8 to 13 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 100 to 120 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Burch and similar soils: 45 percent

Quencheroo and similar soils: 30 percent

Dryck and similar soils: 15 percent

Minor components: 5 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Burch

Setting

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium

Typical profile

Ap - 0 to 13 inches: loam

Bw - 13 to 21 inches: silt loam

Bk - 21 to 60 inches: very fine sandy loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 5 percent

Available water storage in profile: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): 2c

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: B

Hydric soil rating: No

Description of Quencheroo

Setting

Landform: Stream terraces

Custom Soil Resource Report

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium over bedrock derived from basalt

Typical profile

A - 0 to 8 inches: loam

Bw1 - 8 to 14 inches: loam

Bw2 - 14 to 27 inches: loam

C - 27 to 56 inches: silt loam

R - 56 to 66 inches: bedrock

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: 40 to 60 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Moderate (about 8.5 inches)

Interpretive groups

Land capability classification (irrigated): 2c

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: C

Hydric soil rating: No

Description of Dryck

Setting

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium

Typical profile

Ap - 0 to 8 inches: very fine sandy loam

Bw - 8 to 23 inches: very fine sandy loam

2C1 - 23 to 28 inches: fine sand

2C2 - 28 to 60 inches: very gravelly sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 6.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: A

Hydric soil rating: No

Minor Components

Aquolls

Percent of map unit: 5 percent

Landform: Flood plains

Hydric soil rating: Yes

26—Catchell silt loam, 3 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2r8v

Elevation: 2,800 to 5,300 feet

Mean annual precipitation: 8 to 13 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 90 to 120 days

Farmland classification: Farmland of statewide importance, if irrigated

Map Unit Composition

Catchell and similar soils: 80 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Catchell

Setting

Landform: Lava fields

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess and volcanic ash and/or alluvium over bedrock derived from rhyolite and/or welded tuff

Typical profile

E - 0 to 3 inches: silt loam

Btk - 3 to 27 inches: clay

Bk - 27 to 31 inches: loam

Bkqm - 31 to 32 inches: cemented material

R - 32 to 42 inches: bedrock

Properties and qualities

Slope: 3 to 6 percent

Depth to restrictive feature: 20 to 38 inches to duripan; 25 to 40 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 30 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Low (about 4.9 inches)

Interpretive groups

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: D

Hydric soil rating: No

27—Catchell-Gooding complex, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2r8w

Elevation: 3,500 to 5,300 feet

Mean annual precipitation: 8 to 13 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 90 to 125 days

Farmland classification: Not prime farmland

Map Unit Composition

Catchell and similar soils: 50 percent

Gooding and similar soils: 30 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Catchell

Setting

Landform: Lava fields

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess and volcanic ash and/or alluvium over bedrock derived from rhyolite and/or welded tuff

Typical profile

E - 0 to 6 inches: very stony silt loam

Btk - 6 to 21 inches: clay

Bk - 21 to 26 inches: silty clay loam

Bkqm - 26 to 30 inches: cemented material

R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 2 to 6 percent

Depth to restrictive feature: 20 to 38 inches to duripan; 25 to 40 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Custom Soil Resource Report

Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: STONY LOAM 8-12 ARTRW8/PSSPS (R011XB003ID)
Hydric soil rating: No

Description of Gooding

Setting

Landform: Lava fields
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Volcanic ash and/or mixed alluvium and/or loess over bedrock derived from rhyolite and/or basalt and/or welded tuff

Typical profile

Ap - 0 to 10 inches: silt loam
Btb - 10 to 45 inches: silty clay loam
Bkb - 45 to 54 inches: loam
Bkqb - 54 to 59 inches: cemented loam
R - 59 to 69 inches: bedrock

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 40 to 60 inches to duripan; 41 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 8.0
Available water storage in profile: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: D
Ecological site: CLAYPAN 8-12 ARTRW8/PSSPS (R011XA005ID)
Hydric soil rating: No

44—Dryck-Loupence complex, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2rc2

Elevation: 3,500 to 4,600 feet

Mean annual precipitation: 9 to 13 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 100 to 120 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Dryck and similar soils: 55 percent

Loupence and similar soils: 35 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dryck

Setting

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium

Typical profile

Ap - 0 to 8 inches: very fine sandy loam

Bw - 8 to 23 inches: very fine sandy loam

2C1 - 23 to 28 inches: fine sand

2C2 - 28 to 60 inches: very gravelly sand

Properties and qualities

Slope: 0 to 1 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 6.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: A

Hydric soil rating: No

Description of Loupence

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

Ap - 0 to 5 inches: silt loam
Bw1 - 5 to 28 inches: silty clay loam
Bw2 - 28 to 42 inches: very fine sandy loam
Bw3 - 42 to 67 inches: silty clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.9 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Aquolls

Percent of map unit: 10 percent
Landform: Flood plains
Hydric soil rating: Yes

46—Elijah-Bruncan complex, 1 to 4 percent slopes

Map Unit Setting

National map unit symbol: 2rc4
Elevation: 2,300 to 5,400 feet
Mean annual precipitation: 8 to 13 inches
Mean annual air temperature: 45 to 54 degrees F
Frost-free period: 85 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Elijah and similar soils: 55 percent

Bruncan and similar soils: 25 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Elijah

Setting

Landform: Lava plains, buttes

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Lacustrine deposits and/or loess and/or alluvium over bedrock derived from basalt

Typical profile

Ap - 0 to 5 inches: silt loam

Bt - 5 to 15 inches: silt loam

Bk - 15 to 32 inches: silt loam

Bkqm - 32 to 53 inches: cemented material

R - 53 to 63 inches: bedrock

Properties and qualities

Slope: 1 to 4 percent

Depth to restrictive feature: 20 to 40 inches to duripan; 40 to 60 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 40 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Sodium adsorption ratio, maximum in profile: 5.0

Available water storage in profile: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: C

Hydric soil rating: No

Description of Bruncan

Setting

Landform: Ridges, buttes

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Volcanic ash and/or loess over mixed alluvium over bedrock derived from volcanic rock

Typical profile

Ap - 0 to 6 inches: silt loam

Bt - 6 to 14 inches: silt loam

Bkq - 14 to 18 inches: very cobbly silt loam

Custom Soil Resource Report

Bkqm - 18 to 37 inches: cemented material

R - 37 to 47 inches: bedrock

Properties and qualities

Slope: 1 to 4 percent

Depth to restrictive feature: 11 to 20 inches to duripan; 13 to 37 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 40 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Sodium adsorption ratio, maximum in profile: 5.0

Available water storage in profile: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): 4s

Land capability classification (nonirrigated): 6s

Hydrologic Soil Group: D

Hydric soil rating: No

47—Elijah-Gooding complex, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2rc5

Elevation: 2,300 to 5,300 feet

Mean annual precipitation: 8 to 13 inches

Mean annual air temperature: 45 to 54 degrees F

Frost-free period: 90 to 160 days

Farmland classification: Farmland of statewide importance, if irrigated

Map Unit Composition

Elijah and similar soils: 50 percent

Gooding and similar soils: 30 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Elijah

Setting

Landform: Hills

Landform position (two-dimensional): Backslope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Lacustrine deposits and/or loess and/or alluvium over bedrock derived from basalt

Typical profile

Ap - 0 to 5 inches: silt loam
Bt - 5 to 15 inches: silty clay loam
Bk - 15 to 31 inches: silt loam
Bkqm - 31 to 45 inches: cemented material
R - 45 to 55 inches: bedrock

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 20 to 40 inches to duripan; 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Gooding

Setting

Landform: Lava fields
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Volcanic ash and/or mixed alluvium and/or loess over bedrock derived from rhyolite and/or basalt and/or welded tuff

Typical profile

Ap - 0 to 10 inches: silt loam
Btb - 10 to 45 inches: silty clay loam
Bkb - 45 to 54 inches: loam
Bkqb - 54 to 59 inches: cemented loam
R - 59 to 69 inches: bedrock

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 40 to 60 inches to duripan; 41 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Sodium adsorption ratio, maximum in profile: 8.0

Available water storage in profile: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): 4s

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: D

Hydric soil rating: No

48—Elijah-McPan complex, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2rc6

Elevation: 2,300 to 4,700 feet

Mean annual precipitation: 8 to 11 inches

Mean annual air temperature: 45 to 54 degrees F

Frost-free period: 100 to 160 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Elijah and similar soils: 50 percent

Mcpan and similar soils: 35 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Elijah

Setting

Landform: Hills

Landform position (two-dimensional): Backslope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Lacustrine deposits and/or loess and/or alluvium over bedrock derived from basalt

Typical profile

Ap - 0 to 5 inches: silt loam

Bt - 5 to 15 inches: silty clay loam

Bk - 15 to 31 inches: silt loam

Bkqm - 31 to 45 inches: cemented material

R - 45 to 55 inches: bedrock

Properties and qualities

Slope: 2 to 6 percent

Depth to restrictive feature: 20 to 40 inches to duripan; 40 to 60 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Custom Soil Resource Report

Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Mcpan

Setting

Landform: Lava fields
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty alluvium and/or loess over bedrock derived from volcanic rock

Typical profile

Ap - 0 to 6 inches: silt loam
Btk - 6 to 20 inches: silty clay loam
Bkq - 20 to 27 inches: cobbly loam
Bkqm - 27 to 29 inches: cemented material
R - 29 to 39 inches: bedrock

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 39 inches to duripan; 21 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Hydric soil rating: No

70—Gooding-Catchell complex, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2rg4

Elevation: 3,500 to 5,300 feet

Mean annual precipitation: 8 to 13 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 90 to 125 days

Farmland classification: Not prime farmland

Map Unit Composition

Gooding and similar soils: 55 percent

Catchell and similar soils: 30 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gooding

Setting

Landform: Lava fields

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Volcanic ash and/or mixed alluvium and/or loess over bedrock derived from rhyolite and/or basalt and/or welded tuff

Typical profile

Ap - 0 to 10 inches: silt loam

Btb - 10 to 45 inches: silty clay loam

Bkb - 45 to 54 inches: loam

Bkqb - 54 to 59 inches: cemented loam

R - 59 to 69 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent

Depth to restrictive feature: 40 to 60 inches to duripan; 41 to 60 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 40 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Sodium adsorption ratio, maximum in profile: 8.0

Available water storage in profile: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): 4s

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: D

Hydric soil rating: No

Description of Catchell

Setting

Landform: Lava fields

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess and volcanic ash and/or alluvium over bedrock derived from rhyolite and/or welded tuff

Typical profile

E - 0 to 6 inches: very stony silt loam

Btk - 6 to 21 inches: clay

Bk - 21 to 26 inches: silty clay loam

Bkqm - 26 to 30 inches: cemented material

R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent

Depth to restrictive feature: 20 to 38 inches to duripan; 25 to 40 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 40 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): 6s

Land capability classification (nonirrigated): 6s

Hydrologic Soil Group: D

Hydric soil rating: No

74—Gooding-Power complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2rg8

Elevation: 2,000 to 5,300 feet

Mean annual precipitation: 8 to 13 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 90 to 170 days

Farmland classification: Farmland of statewide importance, if irrigated

Map Unit Composition

Gooding and similar soils: 55 percent

Power and similar soils: 30 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gooding

Setting

Landform: Lava fields

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Volcanic ash and/or mixed alluvium and/or loess over bedrock derived from rhyolite and/or basalt and/or welded tuff

Typical profile

Ap - 0 to 10 inches: silt loam

Btb - 10 to 45 inches: silty clay loam

Bkb - 45 to 54 inches: loam

Bkqb - 54 to 59 inches: cemented loam

R - 59 to 69 inches: bedrock

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: 40 to 60 inches to duripan; 41 to 60 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 40 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Sodium adsorption ratio, maximum in profile: 8.0

Available water storage in profile: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): 4s

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: D

Hydric soil rating: No

Description of Power

Setting

Landform: Lava fields

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium and/or loess

Typical profile

A - 0 to 6 inches: silt loam

Bt - 6 to 40 inches: silt loam

Bk - 40 to 64 inches: very fine sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Hydric soil rating: No

75—Haploxerolls-Camborthids-Rock outcrop complex, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2rg9
Elevation: 3,500 to 4,400 feet
Mean annual precipitation: 8 to 11 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 100 to 120 days
Farmland classification: Not prime farmland

Map Unit Composition

Haploxerolls and similar soils: 50 percent
Camborthids and similar soils: 20 percent
Rock outcrop: 15 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Haploxerolls

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

A - 0 to 16 inches: loam
2C - 16 to 60 inches: very gravelly sand

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: A
Ecological site: LOAMY BOTTOM 8-14 ARTRT/LECI4 (R011XY015ID)
Hydric soil rating: No

Description of Camborthids

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium over bedrock derived from sedimentary rock

Typical profile

A - 0 to 14 inches: loamy sand
Bw - 14 to 17 inches: sandy loam
R - 17 to 27 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 1.7 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: SHALLOW LOAMY 8-12 ARTRT/PSSPS (R011XA003ID)
Hydric soil rating: No

Description of Rock Outcrop

Typical profile

R - 0 to 60 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent

Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8

Hydric soil rating: Unranked

Minor Components

Aquolls

Percent of map unit: 15 percent

Landform: Depressions

Hydric soil rating: Yes

106—Lava flows-Lithic Torriorthents complex, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2r4s

Elevation: 3,500 to 4,400 feet

Mean annual precipitation: 9 to 13 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 90 to 120 days

Farmland classification: Not prime farmland

Map Unit Composition

Lava flows: 70 percent

Lithic torriorthents and similar soils: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lava Flows

Typical profile

R - 0 to 60 inches: bedrock

Properties and qualities

Slope: 2 to 8 percent

Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8

Hydric soil rating: Unranked

Description of Lithic Torriorthents

Setting

Landform: Depressions

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess over bedrock derived from basalt

Typical profile

A - 0 to 2 inches: very cobbly silt loam

Bw - 2 to 9 inches: cobbly silt loam

R - 9 to 19 inches: bedrock

Properties and qualities

Slope: 2 to 8 percent

Depth to restrictive feature: 6 to 10 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 6.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 5 percent

Available water storage in profile: Very low (about 1.1 inches)

Interpretive groups

Land capability classification (irrigated): 7e

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: D

Ecological site: SHALLOW LOAMY 8-12 - Provisional (R011XY004ID)

Hydric soil rating: No

147—Power silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2r67

Elevation: 2,000 to 4,600 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 100 to 170 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Power and similar soils: 85 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Power

Setting

Landform: Lava fields, buttes

Custom Soil Resource Report

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium and/or loess

Typical profile

A - 0 to 10 inches: silt loam
Bt - 10 to 40 inches: silt loam
Bk - 40 to 64 inches: very fine sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: High (about 11.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Hydric soil rating: No

151—Quencheroo-Loupence complex, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2r6d
Elevation: 3,500 to 4,200 feet
Mean annual precipitation: 8 to 11 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 100 to 120 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Quencheroo and similar soils: 65 percent
Loupence and similar soils: 20 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Quencheroo

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Mixed alluvium over bedrock derived from basalt

Typical profile

A - 0 to 5 inches: silt loam
Bw1 - 5 to 11 inches: loam
Bw2 - 11 to 21 inches: loam
C1 - 21 to 30 inches: silt loam
C2 - 30 to 49 inches: silt loam
R - 49 to 59 inches: bedrock

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Loupence

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

Ap - 0 to 5 inches: silt loam
Bw1 - 5 to 28 inches: silty clay loam
Bw2 - 28 to 42 inches: very fine sandy loam
Bw3 - 42 to 67 inches: silty clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.9 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Aquolls

Percent of map unit: 5 percent

Landform: Flood plains

Hydric soil rating: Yes

181—Starbuck-McPan-Rock outcrop complex, 2 to 20 percent slopes

Map Unit Setting

National map unit symbol: 2r7g

Elevation: 2,900 to 4,700 feet

Mean annual precipitation: 8 to 11 inches

Mean annual air temperature: 46 to 54 degrees F

Frost-free period: 95 to 140 days

Farmland classification: Not prime farmland

Map Unit Composition

Starbuck and similar soils: 40 percent

Mcpan and similar soils: 30 percent

Rock outcrop: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Starbuck

Setting

Landform: Ridges

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium and/or eolian deposits over bedrock derived from basalt

Typical profile

A - 0 to 3 inches: silt loam

Bw1 - 3 to 10 inches: silt loam

Bw2 - 10 to 14 inches: silt loam

R - 14 to 24 inches: bedrock

Properties and qualities

Slope: 2 to 20 percent

Depth to restrictive feature: 12 to 20 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Very low (about 2.3 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: SHALLOW LOAMY 8-12 ARTRT/PSSPS (R011XA003ID)
Hydric soil rating: No

Description of Mcpan

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty alluvium and/or loess over bedrock derived from volcanic rock

Typical profile

Ap - 0 to 5 inches: silt loam
Btk - 5 to 23 inches: silt loam
Bkq - 23 to 28 inches: silt loam
Bkqm - 28 to 29 inches: cemented material
R - 29 to 39 inches: bedrock

Properties and qualities

Slope: 2 to 10 percent
Depth to restrictive feature: 20 to 39 inches to duripan; 21 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Ecological site: LOAMY 8-12 - Provisional (R011XY001ID)
Hydric soil rating: No

Description of Rock Outcrop

Typical profile

R - 0 to 60 inches: bedrock

Properties and qualities

Slope: 2 to 20 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified

Custom Soil Resource Report

Land capability classification (nonirrigated): 8
Hydric soil rating: Unranked

215—Water

Map Unit Composition

Water: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Physical Soil Properties

This table shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is

given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity (*K_{sat}*), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity (K_{sat}) refers to the ease with which pores in a saturated soil transmit water. The estimates in the table are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity (*K_{sat}*) is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause

damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil.

Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (K_w and K_f) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and K_{sat} . Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor K_w indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor K_f indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook."

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Reference:

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. (<http://soils.usda.gov>)

Custom Soil Resource Report

Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/in</i>	<i>Pct</i>	<i>Pct</i>					
24—Burch-Quencheroo-Dryck complex, 0 to 2 percent slopes														
Burch	0-13	-42-	-38-	15-20- 25	1.35-1.40-1.45	4.00-23.29-42.34	0.12-0.15-0.17	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.37	.37	5	6	48
	13-21	-30-	-55-	13-16- 18	1.25-1.30-1.35	4.00-9.00-14.11	0.14-0.17-0.20	0.0- 1.5- 2.9	0.5- 0.8- 1.0	.49	.49			
	21-60	-63-	-24-	10-13- 16	1.40-1.48-1.55	4.00-23.29-42.34	0.12-0.14-0.16	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.49	.49			
Quencheroo	0-8	-42-	-38-	16-20- 24	1.30-1.35-1.40	4.00-9.00-14.11	0.14-0.17-0.20	0.0- 1.5- 2.9	2.0- 2.5- 3.0	.37	.37	3	6	48
	8-14	-37-	-36-	24-27- 31	1.25-1.35-1.45	1.41-2.82-4.23	0.12-0.15-0.18	3.0- 4.5- 5.9	1.0- 1.5- 2.0	.32	.32			
	14-27	-37-	-36-	24-27- 31	1.20-1.30-1.40	1.41-2.82-4.23	0.12-0.15-0.18	3.0- 4.5- 5.9	1.0- 1.5- 2.0	.32	.32			
	27-56	-26-	-53-	16-21- 25	1.20-1.30-1.40	4.00-9.00-14.11	0.12-0.15-0.18	0.0- 1.5- 2.9	0.7- 0.9- 1.0	.43	.43			
	56-66	—	—	—	—	—	—	—	—					
Dryck	0-8	-61-	-24-	12-15- 18	1.35-1.40-1.45	4.00-23.29-42.34	0.12-0.15-0.17	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.37	.37	3	3	86
	8-23	-61-	-24-	12-15- 18	1.35-1.40-1.45	4.00-23.29-42.34	0.11-0.14-0.17	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.43	.43			
	23-28	-96-	- 1-	1- 4- 6	1.35-1.43-1.50	42.00-91.74-141.14	0.08-0.10-0.11	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.02	.02			
	28-60	-90-	- 6-	0- 4- 8	1.60-1.65-1.70	42.34-91.74-141.14	0.03-0.04-0.05	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.02	.02			

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/in</i>	<i>Pct</i>	<i>Pct</i>					
26—Catchell silt loam, 3 to 6 percent slopes														
Catchell	0-3	-26-	-52-	18-22- 25	1.40-1.45-1.50	4.00-9.00-14.11	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.49	.49	2	6	48
	3-27	-28-	-29-	35-43- 50	1.40-1.45-1.50	0.00-0.21-0.42	0.14-0.15-0.16	6.0- 7.5- 8.9	0.5- 1.3- 2.0	.28	.28			
	27-31	-43-	-40-	10-18- 25	1.50-1.55-1.60	4.00-9.00-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.49	.49			
	31-32	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	32-42	—	—	—	—	—	—	—	—					

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
27—Catchell-Gooding complex, 2 to 6 percent slopes														
Catchell	0-6	-26-	-52-	18-22- 25	1.40-1.45-1.50	4.00-9.00-14.11	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.17	.49	2	8	0
	6-21	-28-	-29-	35-43- 50	1.40-1.45-1.50	0.00-0.21-0.42	0.14-0.15-0.16	6.0- 7.5- 8.9	0.5- 1.3- 2.0	.28	.28			
	21-26	-12-	-58-	10-30- 30	1.50-1.55-1.60	4.00-9.00-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.49	.49			
	26-30	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	30-40	—	—	—	—	—	—	—	—					
Gooding	0-10	-25-	-53-	20-23- 25	1.20-1.30-1.40	1.41-2.82-4.23	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.43	.43	3	6	48
	10-45	- 6-	-57-	35-37- 59	1.35-1.45-1.55	0.00-0.21-0.42	0.14-0.18-0.21	6.0- 7.5- 8.9	0.7- 0.9- 1.0	.43	.43			
	45-54	-30-	-45-	25-26- 40	1.25-1.38-1.50	0.42-0.92-1.41	0.14-0.18-0.21	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	54-59	-30-	-45-	25-26- 40	1.25-1.38-1.50	0.01-0.22-0.42	0.00-0.00-0.00	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	59-69	—	—	—	—	—	—	—	—					

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
44—Dryck-Loupence complex, 0 to 1 percent slopes														
Dryck	0-8	-61-	-24-	12-15- 18	1.35-1.40-1.45	4.00-23.29-42.34	0.12-0.15-0.17	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.37	.37	3	3	86
	8-23	-61-	-24-	12-15- 18	1.35-1.40-1.45	4.00-23.29-42.34	0.11-0.14-0.17	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.43	.43			
	23-28	-96-	- 1-	1- 4- 6	1.35-1.43-1.50	42.00-91.74-141.14	0.08-0.10-0.11	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.02	.02			
	28-60	-90-	- 6-	0- 4- 8	1.60-1.65-1.70	42.34-91.74-141.14	0.03-0.04-0.05	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.02	.02			
Loupence	0-5	-11-	-69-	18-20- 22	1.25-1.35-1.45	4.00-9.00-14.11	0.18-0.19-0.20	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.43	.43	5	6	48
	5-28	-10-	-63-	18-28- 28	1.20-1.30-1.40	1.41-2.82-4.23	0.18-0.19-0.20	3.0- 4.5- 5.9	1.0- 1.5- 2.0	.43	.43			
	28-42	-55-	-26-	18-19- 28	1.20-1.30-1.40	1.41-2.82-4.23	0.17-0.18-0.19	3.0- 4.5- 5.9	0.7- 0.9- 1.0	.43	.43			
	42-67	-17-	-55-	14-28- 28	1.20-1.30-1.40	4.00-9.00-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.43	.43			

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
46—Elijah-Bruncan complex, 1 to 4 percent slopes														
Elijah	0-5	-14-	-70-	12-16- 20	1.50-1.55-1.60	4.00-9.00-14.11	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.49	.49	2	5	56
	5-15	- 7-	-73-	16-21- 35	1.40-1.45-1.50	1.41-2.82-4.23	0.19-0.20-0.21	3.0- 4.5- 5.9	0.7- 0.9- 1.0	.55	.55			
	15-32	-12-	-69-	12-19- 26	1.50-1.55-1.60	4.00-9.00-14.11	0.16-0.19-0.21	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.64	.64			
	32-53	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	53-63	—	—	—	—	—	—	—	—					
Bruncan	0-6	-26-	-52-	18-22- 25	1.40-1.45-1.50	1.41-2.82-4.23	0.15-0.17-0.19	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.43	.43	1	6	48
	6-14	-23-	-52-	22-26- 33	1.35-1.40-1.45	1.41-2.82-4.23	0.16-0.18-0.19	3.0- 4.5- 5.9	0.0- 0.3- 0.5	.49	.49			
	14-18	-27-	-54-	14-19- 24	1.35-1.40-1.45	4.00-9.00-14.11	0.08-0.10-0.12	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.17	.55			
	18-37	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	37-47	—	—	—	—	—	—	—	—					

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
47—Elijah-Gooding complex, 0 to 3 percent slopes														
Elijah	0-5	-14-	-70-	12-16- 20	1.50-1.55-1.60	4.00-9.00-14.11	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.49	.49	2	5	56
	5-15	- 7-	-63-	26-31- 35	1.40-1.45-1.50	1.41-2.82-4.23	0.19-0.20-0.21	3.0- 4.5- 5.9	0.7- 0.9- 1.0	.43	.43			
	15-31	-12-	-69-	12-19- 26	1.50-1.55-1.60	4.00-9.00-14.11	0.16-0.19-0.21	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.64	.64			
	31-45	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	45-55	—	—	—	—	—	—	—	—					
Gooding	0-10	-25-	-53-	20-23- 25	1.20-1.30-1.40	1.41-2.82-4.23	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.43	.43	3	6	48
	10-45	- 6-	-57-	35-37- 59	1.35-1.45-1.55	0.00-0.21-0.42	0.14-0.18-0.21	6.0- 7.5- 8.9	0.7- 0.9- 1.0	.43	.43			
	45-54	-30-	-45-	25-26- 40	1.25-1.38-1.50	0.42-0.92-1.41	0.14-0.18-0.21	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	54-59	-30-	-45-	25-26- 40	1.25-1.38-1.50	0.01-0.22-0.42	0.00-0.00-0.00	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	59-69	—	—	—	—	—	—	—	—					

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
48—Elijah-McPan complex, 2 to 6 percent slopes														
Elijah	0-5	-14-	-70-	12-16- 20	1.50-1.55-1.60	4.00-9.00-14.11	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.49	.49	2	5	56
	5-15	- 7-	-63-	26-31- 35	1.40-1.45-1.50	1.41-2.82-4.23	0.19-0.20-0.21	3.0- 4.5- 5.9	0.7- 0.9- 1.0	.43	.43			
	15-31	-12-	-69-	12-19- 26	1.50-1.55-1.60	4.00-9.00-14.11	0.16-0.19-0.21	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.64	.64			
	31-45	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	45-55	—	—	—	—	—	—	—	—					
Mcpan	0-6	-11-	-67-	18-22- 25	1.20-1.35-1.50	4.00-9.00-14.11	0.14-0.17-0.20	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.43	.43	2	6	48
	6-20	- 9-	-63-	24-28- 32	1.20-1.35-1.50	1.41-2.82-4.23	0.14-0.17-0.20	3.0- 4.5- 5.9	0.5- 0.8- 1.0	.49	.49			
	20-27	-33-	-44-	20-23- 26	1.25-1.43-1.60	4.00-9.00-14.11	0.13-0.17-0.20	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.37	.55			
	27-29	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	29-39	—	—	—	—	—	—	—	—					

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
70—Gooding-Catchell complex, 1 to 3 percent slopes														
Gooding	0-10	-25-	-53-	20-23- 25	1.20-1.30-1.40	1.41-2.82-4.23	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.43	.43	3	6	48
	10-45	- 6-	-57-	35-37- 59	1.35-1.45-1.55	0.00-0.21-0.42	0.14-0.18-0.21	6.0- 7.5- 8.9	0.7- 0.9- 1.0	.43	.43			
	45-54	-40-	-35-	15-26- 40	1.25-1.38-1.50	0.42-0.92-1.41	0.14-0.18-0.21	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	54-59	-40-	-35-	25-26- 40	1.25-1.38-1.50	0.01-0.22-0.42	0.00-0.00-0.00	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	59-69	—	—	—	—	—	—	—	—					
Catchell	0-6	-26-	-52-	18-22- 25	1.40-1.45-1.50	4.00-9.00-14.11	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.17	.49	2	8	0
	6-21	-28-	-29-	35-43- 50	1.40-1.45-1.50	0.00-0.21-0.42	0.14-0.15-0.16	6.0- 7.5- 8.9	0.5- 1.3- 2.0	.28	.28			
	21-26	-12-	-58-	18-30- 40	1.50-1.55-1.60	4.00-9.00-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.49	.49			
	26-30	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	30-40	—	—	—	—	—	—	—	—					

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
74—Gooding-Power complex, 0 to 2 percent slopes														
Gooding	0-10	-25-	-53-	20-23- 25	1.20-1.30-1.40	1.41-2.82-4.23	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.43	.43	3	6	48
	10-45	- 6-	-57-	35-37- 59	1.35-1.45-1.55	0.00-0.21-0.42	0.14-0.18-0.21	6.0- 7.5- 8.9	0.7- 0.9- 1.0	.43	.43			
	45-54	-40-	-35-	25-26- 40	1.25-1.38-1.50	0.42-0.92-1.41	0.14-0.18-0.21	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	54-59	-40-	-35-	25-26- 40	1.25-1.38-1.50	0.01-0.22-0.42	0.00-0.00-0.00	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	59-69	—	—	—	—	—	—	—	—					
Power	0-6	-11-	-69-	18-20- 22	1.30-1.40-1.50	4.00-9.00-14.11	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.43	.43	5	6	48
	6-40	- 7-	-74-	14-20- 35	1.20-1.35-1.50	1.41-2.82-4.23	0.16-0.19-0.21	3.0- 4.5- 5.9	0.5- 0.8- 1.0	.55	.55			
	40-64	-61-	-22-	15-18- 20	1.35-1.45-1.55	4.00-9.00-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.55	.55			

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
75— Haploxerolls- Camborthids- Rock outcrop complex, 1 to 3 percent slopes														
Haploxerolls	0-16	-45-	-42-	7-14- 20	1.35-1.43- 1.50	4.00-23.29-42.3 4	0.08-0.13-0.1 7	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.28	.28	2	5	56
	16-60	-90-	- 6-	0- 4- 8	1.60-1.65- 1.70	42.34-91.74-14 1.14	0.03-0.04-0.0 5	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.02	.02			
Camborthids	0-14	-84-	- 9-	5- 8- 10	1.35-1.48- 1.60	4.00-72.69-141. 14	0.07-0.09-0.1 0	0.0- 1.5- 2.9	0.5- 0.8- 1.0	.28	.28	1	2	134
	14-17	-66-	-19-	13-15- 17	1.25-1.33- 1.40	4.00-9.00-14.11	0.12-0.15-0.1 7	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.32	.32			
	17-27	—	—	—	—	—	—	—	—					
Rock outcrop	0-60	—	—	—	—	—	—	—	—					
106—Lava flows-Lithic Torriorthents complex, 2 to 8 percent slopes														
Lava flows	0-60	—	—	—	—	—	—	—	—					
Lithic torriorthents	0-2	-30-	-55-	10-15- 20	1.25-1.35- 1.45	4.00-23.29-42.3 4	0.10-0.12-0.1 3	0.0- 1.5- 2.9	0.5- 0.8- 1.0	.20	.49	1	7	38
	2-9	-30-	-55-	10-15- 20	1.25-1.35- 1.45	4.00-23.29-42.3 4	0.10-0.12-0.1 3	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.32	.55			
	9-19	—	—	—	—	—	—	—	—					

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/In</i>	<i>Pct</i>	<i>Pct</i>					
147—Power silt loam, 0 to 3 percent slopes														
Power	0-10	-11-	-69-	18-20- 22	1.30-1.40-1.50	4.00-9.00-14.11	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.43	.43	5	6	48
	10-40	- 7-	-67-	24-27- 35	1.20-1.35-1.50	1.41-2.82-4.23	0.16-0.19-0.21	3.0- 4.5- 5.9	0.5- 0.8- 1.0	.49	.49			
	40-64	-61-	-22-	15-18- 20	1.35-1.45-1.55	4.00-9.00-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.55	.55			

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
151— Quencheroo-Loupence complex, 0 to 1 percent slopes														
Quencheroo	0-5	-27-	-54-	16-20- 24	1.30-1.35-1.40	4.00-9.00-14.11	0.14-0.17-0.20	0.0- 1.5- 2.9	2.0- 2.5- 3.0	.43	.43	3	6	48
	5-11	-37-	-36-	24-27- 31	1.25-1.35-1.45	1.41-2.82-4.23	0.12-0.15-0.18	3.0- 4.5- 5.9	1.0- 1.5- 2.0	.32	.32			
	11-21	-37-	-36-	24-27- 31	1.20-1.30-1.40	1.41-2.82-4.23	0.12-0.15-0.18	3.0- 4.5- 5.9	1.0- 1.5- 2.0	.32	.32			
	21-30	-26-	-53-	16-21- 25	1.20-1.30-1.40	4.00-9.00-14.11	0.12-0.15-0.18	0.0- 1.5- 2.9	0.7- 0.9- 1.0	.43	.43			
	30-49	-22-	-58-	16-21- 25	1.30-1.40-1.50	4.00-9.00-14.11	0.09-0.13-0.17	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.55	.55			
	49-59	—	—	—	—	—	—	—	—					
Loupence	0-5	-11-	-69-	18-20- 22	1.25-1.35-1.45	4.00-9.00-14.11	0.18-0.19-0.20	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.43	.43	5	6	48
	5-28	-10-	-58-	18-33- 40	1.20-1.30-1.40	1.41-2.82-4.23	0.18-0.19-0.20	3.0- 4.5- 5.9	1.0- 1.5- 2.0	.37	.37			
	28-42	-55-	-27-	15-18- 38	1.20-1.30-1.40	1.41-2.82-4.23	0.17-0.18-0.19	3.0- 4.5- 5.9	0.7- 0.9- 1.0	.43	.43			
	42-67	-17-	-52-	14-31- 38	1.20-1.30-1.40	4.00-9.00-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.37	.37			

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
181—Starbuck-McPan-Rock outcrop complex, 2 to 20 percent slopes														
Starbuck	0-3	-29-	-53-	15-18- 20	1.30-1.38-1.45	4.00-9.00-14.11	0.14-0.16-0.18	0.0- 1.5- 2.9	0.7- 0.9- 1.0	.43	.43	1	5	56
	3-10	-30-	-54-	14-16- 18	1.30-1.40-1.50	4.00-9.00-14.11	0.13-0.16-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.55	.55			
	10-14	-30-	-54-	14-16- 18	1.30-1.40-1.50	4.00-9.00-14.11	0.13-0.16-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.55	.55			
	14-24	—	—	—	—	—	—	—	—					
Mcpan	0-5	-11-	-67-	18-22- 25	1.20-1.35-1.50	4.00-9.00-14.11	0.14-0.17-0.20	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.43	.43	2	6	48
	5-23	- 9-	-65-	24-26- 32	1.20-1.35-1.50	1.41-2.82-4.23	0.14-0.17-0.20	3.0- 4.5- 5.9	0.5- 0.8- 1.0	.49	.49			
	23-28	-23-	-54-	20-23- 26	1.25-1.43-1.60	4.00-9.00-14.11	0.13-0.17-0.20	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.55	.55			
	28-29	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	29-39	—	—	—	—	—	—	—	—					
Rock outcrop	0-60	—	—	—	—	—	—	—	—					
215—Water														
Water	—	—	—	—	—	—	—	—	—					

Water Features

This folder contains tabular reports that present soil hydrology information. The reports (tables) include all selected map units and components for each map unit. Water Features include ponding frequency, flooding frequency, and depth to water table.

Hydrologic Soil Group and Surface Runoff

This table gives estimates of various soil water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

Surface runoff refers to the loss of water from an area by flow over the land surface. Surface runoff classes are based on slope, climate, and vegetative cover. The concept indicates relative runoff for very specific conditions. It is assumed that the surface of the soil is bare and that the retention of surface water resulting from irregularities in the ground surface is minimal. The classes are negligible, very low, low, medium, high, and very high.

Report—Hydrologic Soil Group and Surface Runoff

Absence of an entry indicates that the data were not estimated. The dash indicates no documented presence.

Custom Soil Resource Report

Hydrologic Soil Group and Surface Runoff—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties			
Map symbol and soil name	Pct. of map unit	Surface Runoff	Hydrologic Soil Group
24—Burch-Quencheroo-Dryck complex, 0 to 2 percent slopes			
Burch	45	—	B
Quencheroo	30	—	C
Dryck	15	—	A
26—Catchell silt loam, 3 to 6 percent slopes			
Catchell	80	—	D
27—Catchell-Gooding complex, 2 to 6 percent slopes			
Catchell	50	—	D
Gooding	30	—	D
44—Dryck-Loupence complex, 0 to 1 percent slopes			
Dryck	55	—	A
Loupence	35	—	C
46—Elijah-Bruncan complex, 1 to 4 percent slopes			
Elijah	55	—	C
Bruncan	25	—	D
47—Elijah-Gooding complex, 0 to 3 percent slopes			
Elijah	50	—	C
Gooding	30	—	D
48—Elijah-McPan complex, 2 to 6 percent slopes			
Elijah	50	—	C
Mcpan	35	—	C
70—Gooding-Catchell complex, 1 to 3 percent slopes			
Gooding	55	—	D
Catchell	30	—	D
74—Gooding-Power complex, 0 to 2 percent slopes			
Gooding	55	—	D
Power	30	—	C
75—Haploxerolls-Camborthids-Rock outcrop complex, 1 to 3 percent slopes			
Haploxerolls	50	—	A
Camborthids	20	—	D
Rock outcrop	15	—	—
106—Lava flows-Lithic Torriorthents complex, 2 to 8 percent slopes			
Lava flows	70	—	—
Lithic torriorthents	20	—	D
147—Power silt loam, 0 to 3 percent slopes			
Power	85	—	C

Custom Soil Resource Report

Hydrologic Soil Group and Surface Runoff—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties			
Map symbol and soil name	Pct. of map unit	Surface Runoff	Hydrologic Soil Group
151—Quencheroo-Loupence complex, 0 to 1 percent slopes			
Quencheroo	65	—	C
Loupence	20	—	C
181—Starbuck-McPan-Rock outcrop complex, 2 to 20 percent slopes			
Starbuck	40	—	D
Mcpan	30	—	C
Rock outcrop	20	—	—
215—Water			
Water	100	—	—

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Custom Soil Resource Report

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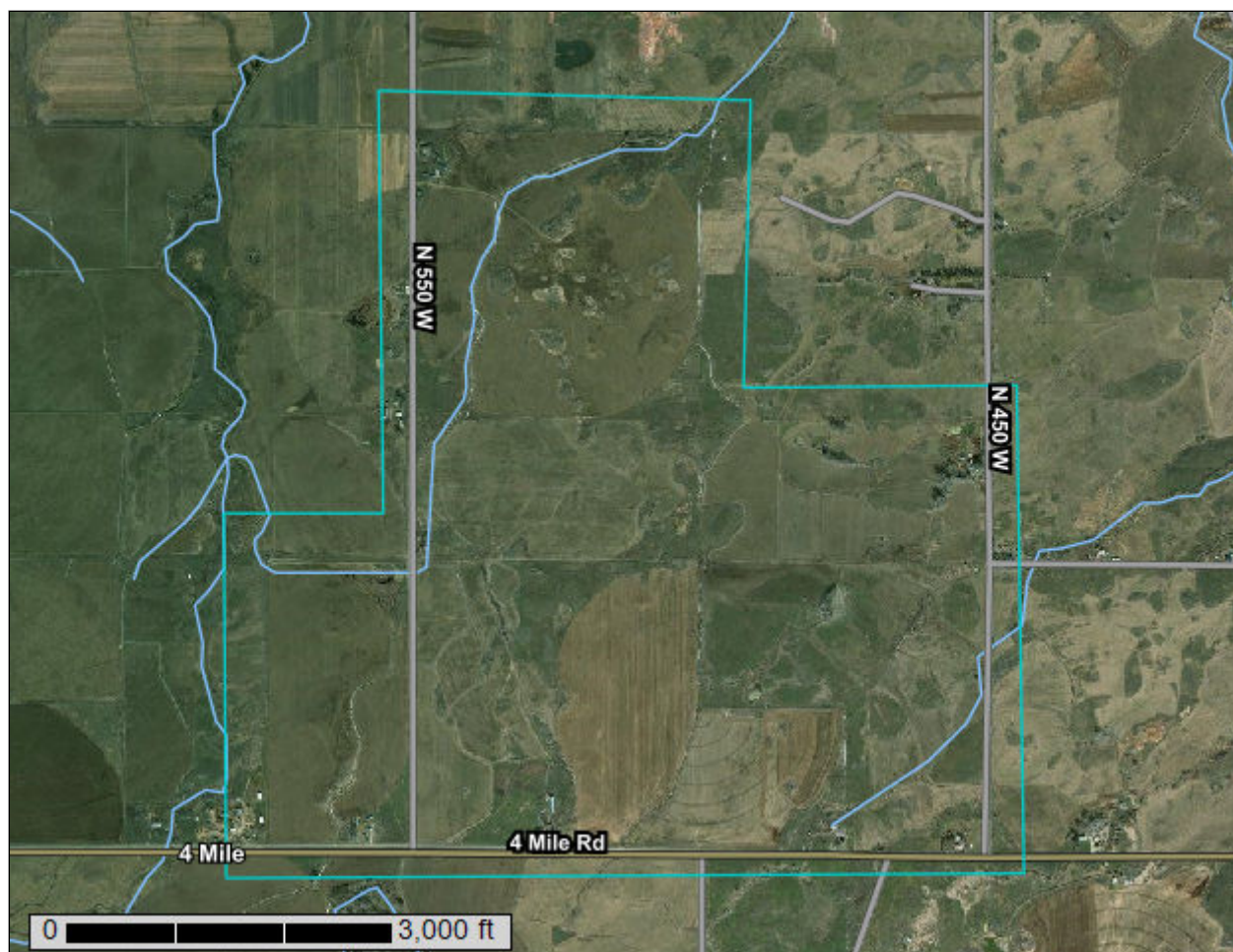
United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

Preface	2
How Soil Surveys Are Made	5
Soil Map	8
Soil Map (West Fields).....	9
Legend.....	10
Map Unit Legend (West Fields).....	11
Map Unit Descriptions (West Fields).....	11
Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties.....	13
24—Burch-Quencherloo-Dryck complex, 0 to 2 percent slopes.....	13
26—Catchell silt loam, 3 to 6 percent slopes.....	15
48—Elijah-McPan complex, 2 to 6 percent slopes.....	16
70—Gooding-Catchell complex, 1 to 3 percent slopes.....	17
74—Gooding-Power complex, 0 to 2 percent slopes.....	19
75—Haploxerolls-Camborthids-Rock outcrop complex, 1 to 3 percent slopes.....	21
147—Power silt loam, 0 to 3 percent slopes.....	23
Soil Information for All Uses	25
Soil Reports.....	25
Soil Physical Properties.....	25
Physical Soil Properties (West Fields).....	25
Water Features.....	34
Water Features (West Fields).....	34
References	38

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

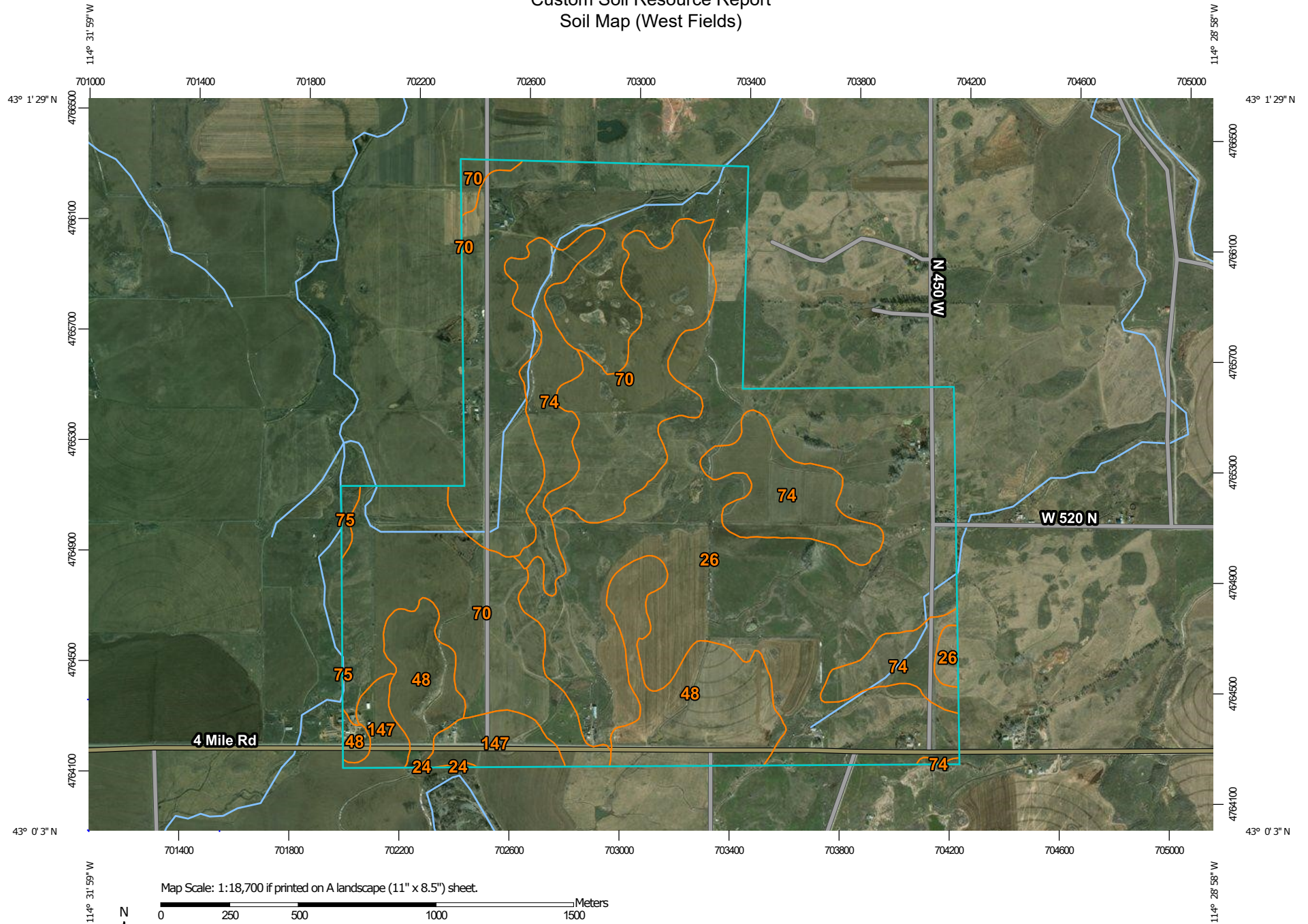
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identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map (West Fields)



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit

 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water

 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot

 Sinkhole

 Slide or Slip

 Sodic Spot

 Spoil Area

 Stony Spot

 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

Water Features

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Wood River Area, Idaho, Gooding County and

Parts of Blaine, Lincoln, and Minidoka Counties

Survey Area Data: Version 17, Jun 4, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 14, 2012—Nov 8, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (West Fields)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
24	Burch-Quencheroo-Dryck complex, 0 to 2 percent slopes	0.4	0.0%
26	Catchell silt loam, 3 to 6 percent slopes	506.6	54.6%
48	Elijah-McPan complex, 2 to 6 percent slopes	93.6	10.1%
70	Gooding-Catchell complex, 1 to 3 percent slopes	193.6	20.9%
74	Gooding-Power complex, 0 to 2 percent slopes	102.0	11.0%
75	Haploxerolls-Camborthids-Rock outcrop complex, 1 to 3 percent slopes	2.7	0.3%
147	Power silt loam, 0 to 3 percent slopes	29.4	3.2%
Totals for Area of Interest		928.5	100.0%

Map Unit Descriptions (West Fields)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a

given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties

24—Burch-Quencheroo-Dryck complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2r8s

Elevation: 3,500 to 4,600 feet

Mean annual precipitation: 8 to 13 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 100 to 120 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Burch and similar soils: 45 percent

Quencheroo and similar soils: 30 percent

Dryck and similar soils: 15 percent

Minor components: 5 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Burch

Setting

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium

Typical profile

Ap - 0 to 13 inches: loam

Bw - 13 to 21 inches: silt loam

Bk - 21 to 60 inches: very fine sandy loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.57 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Available water capacity: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): 2c

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: B

Hydric soil rating: No

Description of Quencheroo

Setting

Landform: Stream terraces

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Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium over bedrock derived from basalt

Typical profile

A - 0 to 8 inches: loam

Bw1 - 8 to 14 inches: loam

Bw2 - 14 to 27 inches: loam

C - 27 to 56 inches: silt loam

R - 56 to 66 inches: bedrock

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: 40 to 60 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Moderate (about 8.5 inches)

Interpretive groups

Land capability classification (irrigated): 2c

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: C

Hydric soil rating: No

Description of Dryck

Setting

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium

Typical profile

Ap - 0 to 8 inches: very fine sandy loam

Bw - 8 to 23 inches: very fine sandy loam

2C1 - 23 to 28 inches: fine sand

2C2 - 28 to 60 inches: very gravelly sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 6.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: A

Hydric soil rating: No

Minor Components

Aquolls

Percent of map unit: 5 percent

Landform: Flood plains

Hydric soil rating: Yes

26—Catchell silt loam, 3 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2r8v

Elevation: 2,800 to 5,300 feet

Mean annual precipitation: 8 to 13 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 90 to 120 days

Farmland classification: Farmland of statewide importance, if irrigated

Map Unit Composition

Catchell and similar soils: 80 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Catchell

Setting

Landform: Lava fields

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess and volcanic ash and/or alluvium over bedrock derived from rhyolite and/or welded tuff

Typical profile

E - 0 to 3 inches: silt loam

Btk - 3 to 27 inches: clay

Bk - 27 to 31 inches: loam

Bkqm - 31 to 32 inches: cemented material

R - 32 to 42 inches: bedrock

Properties and qualities

Slope: 3 to 6 percent

Depth to restrictive feature: 20 to 38 inches to duripan; 25 to 40 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water capacity: Low (about 4.9 inches)

Interpretive groups

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: D

Hydric soil rating: No

48—Elijah-McPan complex, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2rc6

Elevation: 2,300 to 4,700 feet

Mean annual precipitation: 8 to 11 inches

Mean annual air temperature: 45 to 54 degrees F

Frost-free period: 100 to 160 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Elijah and similar soils: 50 percent

Mcpan and similar soils: 35 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Elijah

Setting

Landform: Hills

Landform position (two-dimensional): Backslope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Lacustrine deposits and/or loess and/or alluvium over bedrock derived from basalt

Typical profile

Ap - 0 to 5 inches: silt loam

Bt - 5 to 15 inches: silty clay loam

Bk - 15 to 31 inches: silt loam

Bkqm - 31 to 45 inches: cemented material

R - 45 to 55 inches: bedrock

Properties and qualities

Slope: 2 to 6 percent

Depth to restrictive feature: 20 to 40 inches to duripan; 40 to 60 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Custom Soil Resource Report

Calcium carbonate, maximum content: 40 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water capacity: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Mcpan

Setting

Landform: Lava fields
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty alluvium and/or loess over bedrock derived from volcanic rock

Typical profile

Ap - 0 to 6 inches: silt loam
Btk - 6 to 20 inches: silty clay loam
Bkq - 20 to 27 inches: cobbly loam
Bkqm - 27 to 29 inches: cemented material
R - 29 to 39 inches: bedrock

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 39 inches to duripan; 21 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Hydric soil rating: No

70—Gooding-Catchell complex, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2rg4

Custom Soil Resource Report

Elevation: 3,500 to 5,300 feet
Mean annual precipitation: 8 to 13 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 90 to 125 days
Farmland classification: Not prime farmland

Map Unit Composition

Gooding and similar soils: 55 percent
Catchell and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gooding

Setting

Landform: Lava fields
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Volcanic ash and/or mixed alluvium and/or loess over bedrock derived from rhyolite and/or basalt and/or welded tuff

Typical profile

Ap - 0 to 10 inches: silt loam
Btb - 10 to 45 inches: silty clay loam
Bkb - 45 to 54 inches: loam
Bkqb - 54 to 59 inches: cemented loam
R - 59 to 69 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: 40 to 60 inches to duripan; 41 to 60 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 40 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 8.0
Available water capacity: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Catchell

Setting

Landform: Lava fields
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess and volcanic ash and/or alluvium over bedrock derived from rhyolite and/or welded tuff

Typical profile

E - 0 to 6 inches: very stony silt loam
Btk - 6 to 21 inches: clay
Bk - 21 to 26 inches: silty clay loam
Bkqm - 26 to 30 inches: cemented material
R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: 20 to 38 inches to duripan; 25 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 40 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Hydric soil rating: No

74—Gooding-Power complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2rg8
Elevation: 2,000 to 5,300 feet
Mean annual precipitation: 8 to 13 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 90 to 170 days
Farmland classification: Farmland of statewide importance, if irrigated

Map Unit Composition

Gooding and similar soils: 55 percent
Power and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gooding

Setting

Landform: Lava fields
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Volcanic ash and/or mixed alluvium and/or loess over bedrock derived from rhyolite and/or basalt and/or welded tuff

Typical profile

Ap - 0 to 10 inches: silt loam
Btb - 10 to 45 inches: silty clay loam
Bkb - 45 to 54 inches: loam
Bkqb - 54 to 59 inches: cemented loam
R - 59 to 69 inches: bedrock

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 40 to 60 inches to duripan; 41 to 60 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 40 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 8.0
Available water capacity: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Power

Setting

Landform: Lava fields
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium and/or loess

Typical profile

A - 0 to 6 inches: silt loam
Bt - 6 to 40 inches: silt loam
Bk - 40 to 64 inches: very fine sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water capacity: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): 2e

Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Hydric soil rating: No

75—Haploxerolls-Camborthids-Rock outcrop complex, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2rg9
Elevation: 3,500 to 4,400 feet
Mean annual precipitation: 8 to 11 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 100 to 120 days
Farmland classification: Not prime farmland

Map Unit Composition

Haploxerolls and similar soils: 50 percent
Camborthids and similar soils: 20 percent
Rock outcrop: 15 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Haploxerolls

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

A - 0 to 16 inches: loam
2C - 16 to 60 inches: very gravelly sand

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.57 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: A

Ecological site: R011XY015ID - LOAMY BOTTOM 8-14 ARTRT/LECI4

Hydric soil rating: No

Description of Camborthids

Setting

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium over bedrock derived from sedimentary rock

Typical profile

A - 0 to 14 inches: loamy sand

Bw - 14 to 17 inches: sandy loam

R - 17 to 27 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent

Depth to restrictive feature: 10 to 20 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.57 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: OccasionalNone

Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water capacity: Very low (about 1.7 inches)

Interpretive groups

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: D

Ecological site: R011XA003ID - SHALLOW LOAMY 8-12 ARTRT/PSSPS

Hydric soil rating: No

Description of Rock Outcrop

Typical profile

R - 0 to 60 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent

Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8

Hydric soil rating: Unranked

Minor Components

Aquolls

Percent of map unit: 15 percent

Landform: Depressions

Hydric soil rating: Yes

147—Power silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2r67
Elevation: 2,000 to 4,600 feet
Mean annual precipitation: 8 to 12 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 100 to 170 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Power and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Power

Setting

Landform: Lava fields, buttes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium and/or loess

Typical profile

A - 0 to 10 inches: silt loam
Bt - 10 to 40 inches: silt loam
Bk - 40 to 64 inches: very fine sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water capacity: High (about 11.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Hydric soil rating: No

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Physical Soil Properties (West Fields)

This table shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is

given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity (*K_{sat}*), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity (K_{sat}) refers to the ease with which pores in a saturated soil transmit water. The estimates in the table are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity (*K_{sat}*) is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause

damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil.

Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (K_w and K_f) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and K_{sat} . Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor K_w indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor K_f indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook."

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Reference:

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. (<http://soils.usda.gov>)

Custom Soil Resource Report

Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
24—Burch-Quencheroo-Dryck complex, 0 to 2 percent slopes														
Burch	0-13	-42-	-38-	15-20- 25	1.35-1.40-1.45	4.00-23.29-42.34	0.12-0.15-0.17	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.37	.37	5	6	48
	13-21	-30-	-55-	13-16- 18	1.25-1.30-1.35	4.00-9.00-14.11	0.14-0.17-0.20	0.0- 1.5- 2.9	0.5- 0.8- 1.0	.49	.49			
	21-60	-63-	-24-	10-13- 16	1.40-1.48-1.55	4.00-23.29-42.34	0.12-0.14-0.16	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.49	.49			
Quencheroo	0-8	-42-	-38-	16-20- 24	1.30-1.35-1.40	4.00-9.00-14.11	0.14-0.17-0.20	0.0- 1.5- 2.9	2.0- 2.5- 3.0	.37	.37	3	6	48
	8-14	-37-	-36-	24-27- 31	1.25-1.35-1.45	1.41-2.82-4.23	0.12-0.15-0.18	3.0- 4.5- 5.9	1.0- 1.5- 2.0	.32	.32			
	14-27	-37-	-36-	24-27- 31	1.20-1.30-1.40	1.41-2.82-4.23	0.12-0.15-0.18	3.0- 4.5- 5.9	1.0- 1.5- 2.0	.32	.32			
	27-56	-26-	-53-	16-21- 25	1.20-1.30-1.40	4.00-9.00-14.11	0.12-0.15-0.18	0.0- 1.5- 2.9	0.7- 0.9- 1.0	.43	.43			
	56-66	—	—	—	—	—	—	—	—					
Dryck	0-8	-61-	-24-	12-15- 18	1.35-1.40-1.45	4.00-23.29-42.34	0.12-0.15-0.17	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.37	.37	3	3	86
	8-23	-61-	-24-	12-15- 18	1.35-1.40-1.45	4.00-23.29-42.34	0.11-0.14-0.17	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.43	.43			
	23-28	-96-	- 1-	1- 4- 6	1.35-1.43-1.50	42.00-91.74-141.14	0.08-0.10-0.11	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.02	.02			
	28-60	-90-	- 6-	0- 4- 8	1.60-1.65-1.70	42.34-91.74-141.14	0.03-0.04-0.05	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.02	.02			

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/in</i>	<i>Pct</i>	<i>Pct</i>					
26—Catchell silt loam, 3 to 6 percent slopes														
Catchell	0-3	-26-	-52-	18-22- 25	1.40-1.45-1.50	4.00-9.00-14.11	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.49	.49	2	6	48
	3-27	-28-	-29-	35-43- 50	1.40-1.45-1.50	0.00-0.21-0.42	0.14-0.15-0.16	6.0- 7.5- 8.9	0.5- 1.3- 2.0	.28	.28			
	27-31	-43-	-40-	10-18- 25	1.50-1.55-1.60	4.00-9.00-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.49	.49			
	31-32	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	32-42	—	—	—	—	—	—	—	—					

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
48—Elijah-McPan complex, 2 to 6 percent slopes														
Elijah	0-5	-14-	-70-	12-16- 20	1.50-1.55-1.60	4.00-9.00-14.11	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.49	.49	2	5	56
	5-15	- 7-	-63-	26-31- 35	1.40-1.45-1.50	1.41-2.82-4.23	0.19-0.20-0.21	3.0- 4.5- 5.9	0.7- 0.9- 1.0	.43	.43			
	15-31	-12-	-69-	12-19- 26	1.50-1.55-1.60	4.00-9.00-14.11	0.16-0.19-0.21	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.64	.64			
	31-45	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	45-55	—	—	—	—	—	—	—	—					
Mcpan	0-6	-11-	-67-	18-22- 25	1.20-1.35-1.50	4.00-9.00-14.11	0.14-0.17-0.20	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.43	.43	2	6	48
	6-20	- 9-	-63-	24-28- 32	1.20-1.35-1.50	1.41-2.82-4.23	0.14-0.17-0.20	3.0- 4.5- 5.9	0.5- 0.8- 1.0	.49	.49			
	20-27	-33-	-44-	20-23- 26	1.25-1.43-1.60	4.00-9.00-14.11	0.13-0.17-0.20	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.37	.55			
	27-29	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	29-39	—	—	—	—	—	—	—	—					

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
70—Gooding-Catchell complex, 1 to 3 percent slopes														
Gooding	0-10	-25-	-53-	20-23- 25	1.20-1.30-1.40	1.41-2.82-4.23	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.43	.43	3	6	48
	10-45	- 6-	-57-	35-37- 59	1.35-1.45-1.55	0.00-0.21-0.42	0.14-0.18-0.21	6.0- 7.5- 8.9	0.7- 0.9- 1.0	.43	.43			
	45-54	-40-	-35-	15-26- 40	1.25-1.38-1.50	0.42-0.92-1.41	0.14-0.18-0.21	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	54-59	-40-	-35-	25-26- 40	1.25-1.38-1.50	0.01-0.22-0.42	0.00-0.00-0.00	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	59-69	—	—	—	—	—	—	—	—					
Catchell	0-6	-26-	-52-	18-22- 25	1.40-1.45-1.50	4.00-9.00-14.11	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.17	.49	2	8	0
	6-21	-28-	-29-	35-43- 50	1.40-1.45-1.50	0.00-0.21-0.42	0.14-0.15-0.16	6.0- 7.5- 8.9	0.5- 1.3- 2.0	.28	.28			
	21-26	-12-	-58-	18-30- 40	1.50-1.55-1.60	4.00-9.00-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.49	.49			
	26-30	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	30-40	—	—	—	—	—	—	—	—					

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
74—Gooding-Power complex, 0 to 2 percent slopes														
Gooding	0-10	-25-	-53-	20-23- 25	1.20-1.30-1.40	1.41-2.82-4.23	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.43	.43	3	6	48
	10-45	- 6-	-57-	35-37- 59	1.35-1.45-1.55	0.00-0.21-0.42	0.14-0.18-0.21	6.0- 7.5- 8.9	0.7- 0.9- 1.0	.43	.43			
	45-54	-40-	-35-	25-26- 40	1.25-1.38-1.50	0.42-0.92-1.41	0.14-0.18-0.21	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	54-59	-40-	-35-	25-26- 40	1.25-1.38-1.50	0.01-0.22-0.42	0.00-0.00-0.00	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	59-69	—	—	—	—	—	—	—	—					
Power	0-6	-11-	-69-	18-20- 22	1.30-1.40-1.50	4.00-9.00-14.11	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.43	.43	5	6	48
	6-40	- 7-	-74-	14-20- 35	1.20-1.35-1.50	1.41-2.82-4.23	0.16-0.19-0.21	3.0- 4.5- 5.9	0.5- 0.8- 1.0	.55	.55			
	40-64	-61-	-22-	15-18- 20	1.35-1.45-1.55	4.00-9.00-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.55	.55			

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
75— Haploxerolls- Camborthids- Rock outcrop complex, 1 to 3 percent slopes														
Haploxerolls	0-16	-45-	-42-	7-14- 20	1.35-1.43- 1.50	4.00-23.29-42.3 4	0.08-0.13-0.1 7	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.28	.28	2	5	56
	16-60	-90-	- 6-	0- 4- 8	1.60-1.65- 1.70	42.34-91.74-14 1.14	0.03-0.04-0.0 5	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.02	.02			
Camborthids	0-14	-84-	- 9-	5- 8- 10	1.35-1.48- 1.60	4.00-72.69-141. 14	0.07-0.09-0.1 0	0.0- 1.5- 2.9	0.5- 0.8- 1.0	.28	.28	1	2	134
	14-17	-66-	-19-	13-15- 17	1.25-1.33- 1.40	4.00-9.00-14.11	0.12-0.15-0.1 7	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.32	.32			
	17-27	—	—	—	—	—	—	—	—					
Rock outcrop	0-60	—	—	—	—	—	—	—	—					
147—Power silt loam, 0 to 3 percent slopes														
Power	0-10	-11-	-69-	18-20- 22	1.30-1.40- 1.50	4.00-9.00-14.11	0.19-0.20-0.2 1	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.43	.43	5	6	48
	10-40	- 7-	-67-	24-27- 35	1.20-1.35- 1.50	1.41-2.82-4.23	0.16-0.19-0.2 1	3.0- 4.5- 5.9	0.5- 0.8- 1.0	.49	.49			
	40-64	-61-	-22-	15-18- 20	1.35-1.45- 1.55	4.00-9.00-14.11	0.16-0.17-0.1 8	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.55	.55			

Water Features

This folder contains tabular reports that present soil hydrology information. The reports (tables) include all selected map units and components for each map unit. Water Features include ponding frequency, flooding frequency, and depth to water table.

Water Features (West Fields)

This table gives estimates of various soil water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

Surface runoff refers to the loss of water from an area by flow over the land surface. Surface runoff classes are based on slope, climate, and vegetative cover. The concept indicates relative runoff for very specific conditions. It is assumed that the surface of the soil is bare and that the retention of surface water resulting from irregularities in the ground surface is minimal. The classes are negligible, very low, low, medium, high, and very high.

The *months* in the table indicate the portion of the year in which a water table, ponding, and/or flooding is most likely to be a concern.

Water table refers to a saturated zone in the soil. The water features table indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on

observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table. The kind of water table, apparent or perched, is given if a seasonal high water table exists in the soil. A water table is perched if free water is restricted from moving downward in the soil by a restrictive feature, in most cases a hardpan; there is a dry layer of soil underneath a wet layer. A water table is apparent if free water is present in all horizons from its upper boundary to below 2 meters or to the depth of observation. The water table kind listed is for the first major component in the map unit.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. The table indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Duration and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and *very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Custom Soil Resource Report

Map unit symbol and soil name	Hydrologic group	Surface runoff	Most likely months	Water table			Ponding			Flooding	
				Upper limit	Lower limit	Kind	Surface depth	Duration	Frequency	Duration	Frequency
				<i>Ft</i>	<i>Ft</i>		<i>Ft</i>				
24—Burch-Quencherloo-Dryck complex, 0 to 2 percent slopes											
Burch	B		Jan-Dec	—	—	—	—	—	None	—	None
Quencherloo	C		Jan-Dec	—	—	—	—	—	None	—	None
Dryck	A		Jan-Dec	—	—	—	—	—	None	—	None
26—Catchell silt loam, 3 to 6 percent slopes											
Catchell	D		Jan-Dec	—	—	—	—	—	None	—	None
48—Elijah-McPan complex, 2 to 6 percent slopes											
Elijah	C		Jan-Dec	—	—	—	—	—	None	—	None
Mcpan	C		Jan-Dec	—	—	—	—	—	None	—	None
70—Gooding-Catchell complex, 1 to 3 percent slopes											
Gooding	D		Jan-Dec	—	—	—	—	—	None	—	None
Catchell	D		Jan-Dec	—	—	—	—	—	None	—	None
74—Gooding-Power complex, 0 to 2 percent slopes											
Gooding	D		Jan-Dec	—	—	—	—	—	None	—	None
Power	C		Jan-Dec	—	—	—	—	—	None	—	None
75—Haploxerolls-Camborthids-Rock outcrop complex, 1 to 3 percent slopes											
Haploxerolls	A		Jan-Feb	—	—	—	—	—	None	—	None
			Mar-May	—	—	—	—	—	None	Long (7 to 30 days)	Occasional
			Jun-Dec	—	—	—	—	—	None	—	None
Camborthids	D		Jan-Feb	—	—	—	—	—	None	—	None
			Mar-May	—	—	—	—	—	None	Long (7 to 30 days)	Occasional
			Jun-Dec	—	—	—	—	—	None	—	None
Rock outcrop			Jan-Dec	—	—	—	—	—	None	—	None

Custom Soil Resource Report

Map unit symbol and soil name	Hydrologic group	Surface runoff	Most likely months	Water table			Ponding			Flooding	
				Upper limit	Lower limit	Kind	Surface depth	Duration	Frequency	Duration	Frequency
				<i>Ft</i>	<i>Ft</i>		<i>Ft</i>				
147—Power silt loam, 0 to 3 percent slopes											
Power	C		Jan-Dec	—	—	—	—	—	None	—	None

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United States
Department of
Agriculture

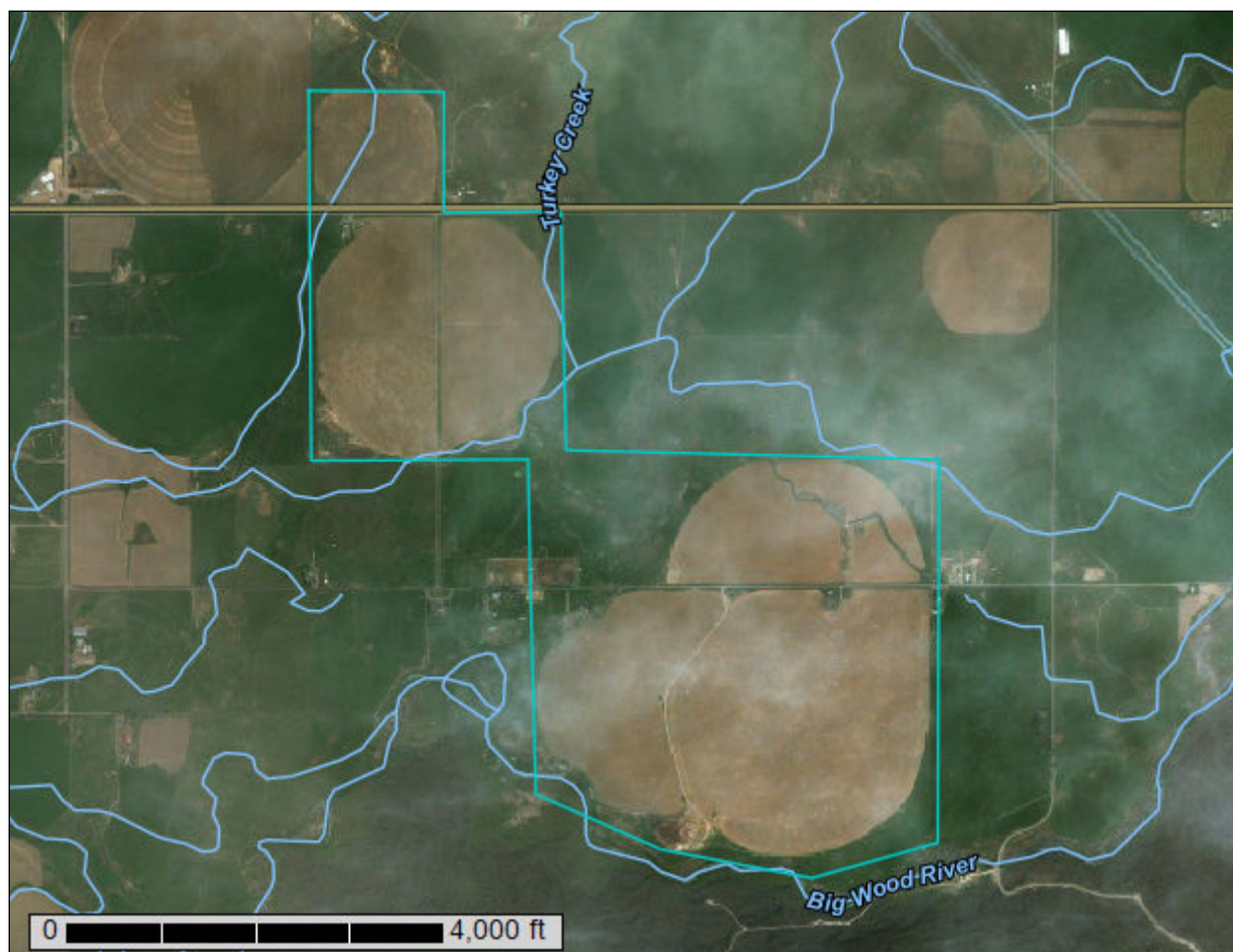
NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties

Four Brothers North Farm



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

Preface	2
How Soil Surveys Are Made	5
Soil Map	8
Soil Map (North Farm).....	9
Legend.....	10
Map Unit Legend (North Farm).....	11
Map Unit Descriptions (North Farm).....	11
Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties.....	14
24—Burch-Quencheroo-Dryck complex, 0 to 2 percent slopes.....	14
27—Catchell-Gooding complex, 2 to 6 percent slopes.....	16
28—Catchell-Gooding complex, 6 to 20 percent slopes.....	18
47—Elijah-Gooding complex, 0 to 3 percent slopes.....	19
69—Gooding silt loam, 0 to 3 percent slopes.....	21
74—Gooding-Power complex, 0 to 2 percent slopes.....	22
75—Haploxerolls-Camborthids-Rock outcrop complex, 1 to 3 percent slopes.....	24
106—Lava flows-Lithic Torriorthents complex, 2 to 8 percent slopes.....	26
147—Power silt loam, 0 to 3 percent slopes.....	27
206—Vining-Kecko-Rock outcrop complex, 2 to 12 percent slopes.....	28
Soil Information for All Uses	30
Soil Reports.....	30
Soil Physical Properties.....	30
Physical Soil Properties (North Farm).....	30
Water Features.....	41
Water Features (North Farm).....	41
References	45

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

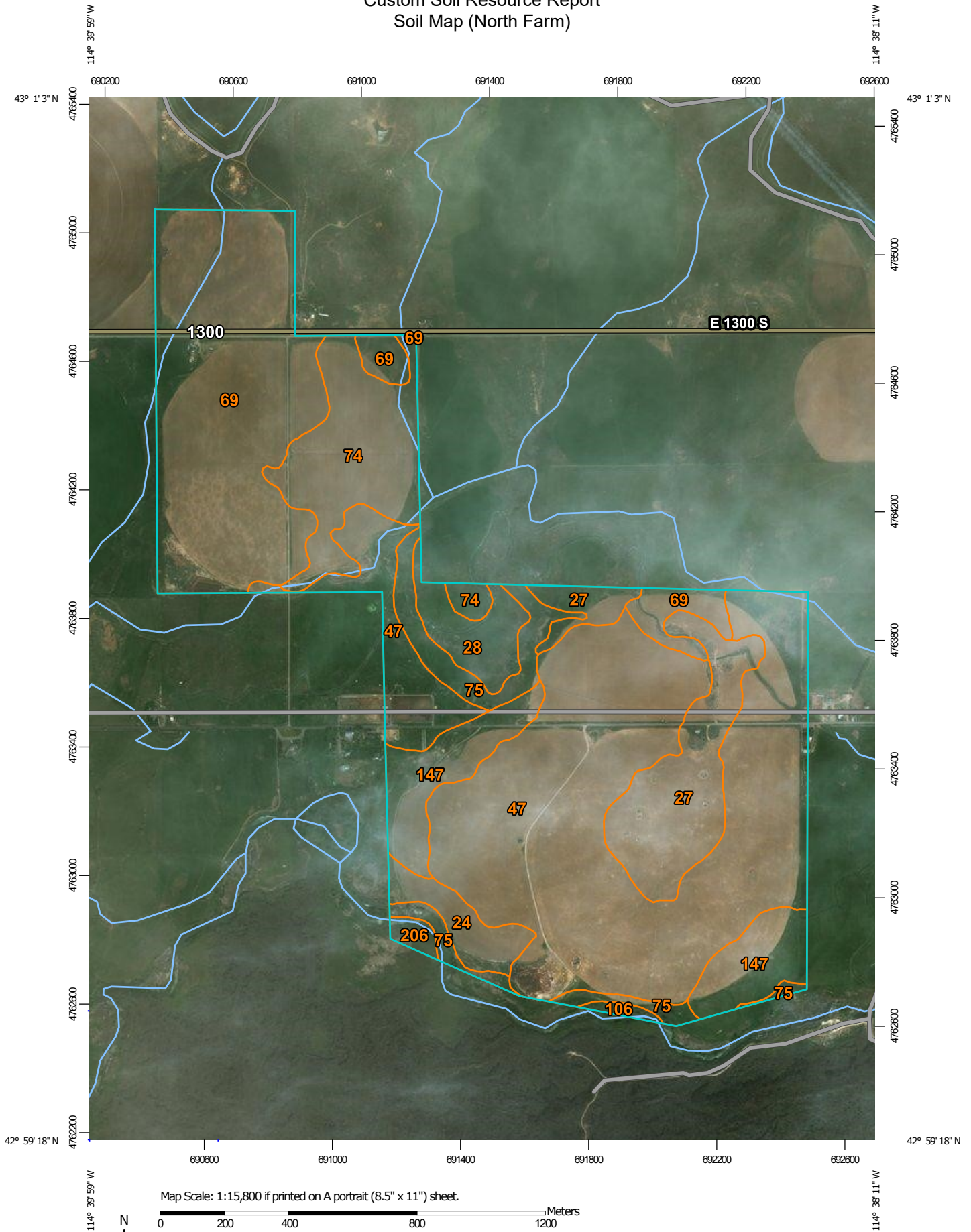
Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

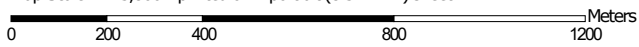
Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map (North Farm)



Map Scale: 1:15,800 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge ticks: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit

 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water

 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot

 Sinkhole

 Slide or Slip

 Sodic Spot

 Spoil Area

 Stony Spot


 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

Water Features

 Streams and Canals

Transportation

 Rails


 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Wood River Area, Idaho, Gooding County and

Parts of Blaine, Lincoln, and Minidoka Counties

Survey Area Data: Version 17, Jun 4, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 30, 2014—Nov 8, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (North Farm)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
24	Burch-Quencherroo-Dryck complex, 0 to 2 percent slopes	14.4	2.3%
27	Catchell-Gooding complex, 2 to 6 percent slopes	54.5	8.8%
28	Catchell-Gooding complex, 6 to 20 percent slopes	17.6	2.8%
47	Elijah-Gooding complex, 0 to 3 percent slopes	254.4	41.1%
69	Gooding silt loam, 0 to 3 percent slopes	148.1	23.9%
74	Gooding-Power complex, 0 to 2 percent slopes	53.5	8.6%
75	Haploxerolls-Camborthids-Rock outcrop complex, 1 to 3 percent slopes	28.2	4.6%
106	Lava flows-Lithic Torriorthents complex, 2 to 8 percent slopes	1.9	0.3%
147	Power silt loam, 0 to 3 percent slopes	43.5	7.0%
206	Vining-Kecko-Rock outcrop complex, 2 to 12 percent slopes	3.2	0.5%
Totals for Area of Interest		619.3	100.0%

Map Unit Descriptions (North Farm)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion

Custom Soil Resource Report

of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties

24—Burch-Quencheroo-Dryck complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2r8s

Elevation: 3,500 to 4,600 feet

Mean annual precipitation: 8 to 13 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 100 to 120 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Burch and similar soils: 45 percent

Quencheroo and similar soils: 30 percent

Dryck and similar soils: 15 percent

Minor components: 5 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Burch

Setting

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium

Typical profile

Ap - 0 to 13 inches: loam

Bw - 13 to 21 inches: silt loam

Bk - 21 to 60 inches: very fine sandy loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.57 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Available water capacity: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): 2c

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: B

Hydric soil rating: No

Description of Quencheroo

Setting

Landform: Stream terraces

Custom Soil Resource Report

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium over bedrock derived from basalt

Typical profile

A - 0 to 8 inches: loam

Bw1 - 8 to 14 inches: loam

Bw2 - 14 to 27 inches: loam

C - 27 to 56 inches: silt loam

R - 56 to 66 inches: bedrock

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: 40 to 60 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Moderate (about 8.5 inches)

Interpretive groups

Land capability classification (irrigated): 2c

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: C

Hydric soil rating: No

Description of Dryck

Setting

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium

Typical profile

Ap - 0 to 8 inches: very fine sandy loam

Bw - 8 to 23 inches: very fine sandy loam

2C1 - 23 to 28 inches: fine sand

2C2 - 28 to 60 inches: very gravelly sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 6.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: A

Hydric soil rating: No

Minor Components

Aquolls

Percent of map unit: 5 percent

Landform: Flood plains

Hydric soil rating: Yes

27—Catchell-Gooding complex, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2r8w

Elevation: 3,500 to 5,300 feet

Mean annual precipitation: 8 to 13 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 90 to 125 days

Farmland classification: Not prime farmland

Map Unit Composition

Catchell and similar soils: 50 percent

Gooding and similar soils: 30 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Catchell

Setting

Landform: Lava fields

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess and volcanic ash and/or alluvium over bedrock derived from rhyolite and/or welded tuff

Typical profile

E - 0 to 6 inches: very stony silt loam

Btk - 6 to 21 inches: clay

Bk - 21 to 26 inches: silty clay loam

Bkqm - 26 to 30 inches: cemented material

R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 2 to 6 percent

Depth to restrictive feature: 20 to 38 inches to duripan; 25 to 40 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Custom Soil Resource Report

Frequency of ponding: None
Calcium carbonate, maximum content: 40 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R011XB003ID - STONY LOAM 8-12 ARTRW8/PSSPS
Hydric soil rating: No

Description of Gooding

Setting

Landform: Lava fields
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Volcanic ash and/or mixed alluvium and/or loess over bedrock derived from rhyolite and/or basalt and/or welded tuff

Typical profile

Ap - 0 to 10 inches: silt loam
Btb - 10 to 45 inches: silty clay loam
Bkb - 45 to 54 inches: loam
Bkqb - 54 to 59 inches: cemented loam
R - 59 to 69 inches: bedrock

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 40 to 60 inches to duripan; 41 to 60 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 40 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 8.0
Available water capacity: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: D
Ecological site: R011XA005ID - CLAYPAN 8-12 ARTRW8/PSSPS
Hydric soil rating: No

28—Catchell-Gooding complex, 6 to 20 percent slopes

Map Unit Setting

National map unit symbol: 2r8x

Elevation: 3,500 to 5,300 feet

Mean annual precipitation: 8 to 13 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 90 to 125 days

Farmland classification: Not prime farmland

Map Unit Composition

Catchell and similar soils: 45 percent

Gooding and similar soils: 35 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Catchell

Setting

Landform: Lava fields

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess and volcanic ash and/or alluvium over bedrock derived from rhyolite and/or welded tuff

Typical profile

E - 0 to 6 inches: very stony silt loam

Btk - 6 to 21 inches: clay

Bk - 21 to 26 inches: silty clay loam

Bkqm - 26 to 30 inches: cemented material

R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 6 to 20 percent

Depth to restrictive feature: 20 to 38 inches to duripan; 25 to 40 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 40 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water capacity: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6s

Hydrologic Soil Group: D

Ecological site: R011XB003ID - STONY LOAM 8-12 ARTRW8/PSSPS

Hydric soil rating: No

Description of Gooding

Setting

Landform: Lava fields

Down-slope shape: Concave

Across-slope shape: Linear

Parent material: Volcanic ash and/or mixed alluvium and/or loess over bedrock derived from rhyolite and/or basalt and/or welded tuff

Typical profile

Ap - 0 to 10 inches: silt loam

Btb - 10 to 45 inches: silty clay loam

Bkb - 45 to 54 inches: loam

Bkqb - 54 to 59 inches: cemented loam

R - 59 to 69 inches: bedrock

Properties and qualities

Slope: 6 to 20 percent

Depth to restrictive feature: 40 to 60 inches to duripan; 41 to 60 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 40 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Sodium adsorption ratio, maximum: 8.0

Available water capacity: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: D

Ecological site: R011XA005ID - CLAYPAN 8-12 ARTRW8/PSSPS

Hydric soil rating: No

47—Elijah-Gooding complex, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2rc5

Elevation: 2,300 to 5,300 feet

Mean annual precipitation: 8 to 13 inches

Mean annual air temperature: 45 to 54 degrees F

Frost-free period: 90 to 160 days

Farmland classification: Farmland of statewide importance, if irrigated

Map Unit Composition

Elijah and similar soils: 50 percent

Gooding and similar soils: 30 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Elijah

Setting

Landform: Hills

Landform position (two-dimensional): Backslope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Lacustrine deposits and/or loess and/or alluvium over bedrock derived from basalt

Typical profile

Ap - 0 to 5 inches: silt loam

Bt - 5 to 15 inches: silty clay loam

Bk - 15 to 31 inches: silt loam

Bkqm - 31 to 45 inches: cemented material

R - 45 to 55 inches: bedrock

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: 20 to 40 inches to duripan; 40 to 60 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 40 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Sodium adsorption ratio, maximum: 5.0

Available water capacity: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: C

Hydric soil rating: No

Description of Gooding

Setting

Landform: Lava fields

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Volcanic ash and/or mixed alluvium and/or loess over bedrock derived from rhyolite and/or basalt and/or welded tuff

Typical profile

Ap - 0 to 10 inches: silt loam

Btb - 10 to 45 inches: silty clay loam

Bkb - 45 to 54 inches: loam

Custom Soil Resource Report

Bkqb - 54 to 59 inches: cemented loam

R - 59 to 69 inches: bedrock

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: 40 to 60 inches to duripan; 41 to 60 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 40 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Sodium adsorption ratio, maximum: 8.0

Available water capacity: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): 4s

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: D

Hydric soil rating: No

69—Gooding silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2rg2

Elevation: 3,500 to 5,300 feet

Mean annual precipitation: 9 to 13 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 90 to 125 days

Farmland classification: Farmland of statewide importance, if irrigated

Map Unit Composition

Gooding and similar soils: 95 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gooding

Setting

Landform: Lava fields

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Volcanic ash and/or mixed alluvium and/or loess over bedrock derived from rhyolite and/or basalt and/or welded tuff

Typical profile

Ap - 0 to 10 inches: silt loam

Btb - 10 to 45 inches: silty clay loam

Bkb - 45 to 54 inches: loam

Custom Soil Resource Report

Bkqb - 54 to 59 inches: cemented loam

R - 59 to 69 inches: bedrock

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: 40 to 60 inches to duripan; 41 to 60 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 40 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Sodium adsorption ratio, maximum: 8.0

Available water capacity: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): 4s

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: D

Hydric soil rating: No

74—Gooding-Power complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2rg8

Elevation: 2,000 to 5,300 feet

Mean annual precipitation: 8 to 13 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 90 to 170 days

Farmland classification: Farmland of statewide importance, if irrigated

Map Unit Composition

Gooding and similar soils: 55 percent

Power and similar soils: 30 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gooding

Setting

Landform: Lava fields

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Volcanic ash and/or mixed alluvium and/or loess over bedrock derived from rhyolite and/or basalt and/or welded tuff

Typical profile

Ap - 0 to 10 inches: silt loam

Btb - 10 to 45 inches: silty clay loam

Bkb - 45 to 54 inches: loam

Custom Soil Resource Report

Bkqb - 54 to 59 inches: cemented loam

R - 59 to 69 inches: bedrock

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: 40 to 60 inches to duripan; 41 to 60 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 40 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Sodium adsorption ratio, maximum: 8.0

Available water capacity: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): 4s

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: D

Hydric soil rating: No

Description of Power

Setting

Landform: Lava fields

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium and/or loess

Typical profile

A - 0 to 6 inches: silt loam

Bt - 6 to 40 inches: silt loam

Bk - 40 to 64 inches: very fine sandy loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Sodium adsorption ratio, maximum: 5.0

Available water capacity: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): 2e

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: C

Hydric soil rating: No

75—Haploxerolls-Camborthids-Rock outcrop complex, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2rg9
Elevation: 3,500 to 4,400 feet
Mean annual precipitation: 8 to 11 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 100 to 120 days
Farmland classification: Not prime farmland

Map Unit Composition

Haploxerolls and similar soils: 50 percent
Camborthids and similar soils: 20 percent
Rock outcrop: 15 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Haploxerolls

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

A - 0 to 16 inches: loam
2C - 16 to 60 inches: very gravelly sand

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: A
Ecological site: R011XY015ID - LOAMY BOTTOM 8-14 ARTRT/LECI4
Hydric soil rating: No

Description of Camborthids

Setting

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium over bedrock derived from sedimentary rock

Typical profile

A - 0 to 14 inches: loamy sand

Bw - 14 to 17 inches: sandy loam

R - 17 to 27 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent

Depth to restrictive feature: 10 to 20 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.57 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: OccasionalNone

Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water capacity: Very low (about 1.7 inches)

Interpretive groups

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: D

Ecological site: R011XA003ID - SHALLOW LOAMY 8-12 ARTRT/PSSPS

Hydric soil rating: No

Description of Rock Outcrop

Typical profile

R - 0 to 60 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent

Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8

Hydric soil rating: Unranked

Minor Components

Aquolls

Percent of map unit: 15 percent

Landform: Depressions

Hydric soil rating: Yes

106—Lava flows-Lithic Torriorthents complex, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2r4s

Elevation: 3,500 to 4,400 feet

Mean annual precipitation: 9 to 13 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 90 to 120 days

Farmland classification: Not prime farmland

Map Unit Composition

Lava flows: 70 percent

Lithic torriorthents and similar soils: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lava Flows

Typical profile

R - 0 to 60 inches: bedrock

Properties and qualities

Slope: 2 to 8 percent

Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8

Hydric soil rating: Unranked

Description of Lithic Torriorthents

Setting

Landform: Depressions

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess over bedrock derived from basalt

Typical profile

A - 0 to 2 inches: very cobbly silt loam

Bw - 2 to 9 inches: cobbly silt loam

R - 9 to 19 inches: bedrock

Properties and qualities

Slope: 2 to 8 percent

Depth to restrictive feature: 6 to 10 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.57 to 6.00 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water capacity: Very low (about 1.1 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: R011XY004ID - SHALLOW LOAMY 8-12 - Provisional
Hydric soil rating: No

147—Power silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2r67
Elevation: 2,000 to 4,600 feet
Mean annual precipitation: 8 to 12 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 100 to 170 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Power and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Power

Setting

Landform: Lava fields, buttes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium and/or loess

Typical profile

A - 0 to 10 inches: silt loam
Bt - 10 to 40 inches: silt loam
Bk - 40 to 64 inches: very fine sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Sodium adsorption ratio, maximum: 5.0
Available water capacity: High (about 11.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Hydric soil rating: No

206—Vining-Kecko-Rock outcrop complex, 2 to 12 percent slopes

Map Unit Setting

National map unit symbol: 2r8c
Elevation: 2,800 to 4,700 feet
Mean annual precipitation: 8 to 12 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 95 to 120 days
Farmland classification: Not prime farmland

Map Unit Composition

Vining and similar soils: 35 percent
Kecko and similar soils: 30 percent
Rock outcrop: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vining

Setting

Landform: Lava plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium and/or eolian deposits over bedrock derived from basalt

Typical profile

A - 0 to 6 inches: fine sandy loam
Bw - 6 to 20 inches: fine sandy loam
C - 20 to 24 inches: sandy loam
2R - 24 to 34 inches: bedrock

Properties and qualities

Slope: 2 to 12 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.6 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Custom Soil Resource Report

Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: B
Ecological site: R011XA009ID - LOAMY 8-12 ARTRT/PSSPS
Hydric soil rating: No

Description of Kecko

Setting

Landform: Lava plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium and/or eolian deposits

Typical profile

A - 0 to 5 inches: loamy fine sand
Bw - 5 to 30 inches: fine sandy loam
Bk - 30 to 60 inches: fine sandy loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 25 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water capacity: High (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: R011XA014ID - SANDY 8-14 ARTRT/HECOC8-ACHY
Hydric soil rating: No

Description of Rock Outcrop

Typical profile

R - 0 to 60 inches: bedrock

Properties and qualities

Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Unranked

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Physical Soil Properties (North Farm)

This table shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is

given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity (*K_{sat}*), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity (K_{sat}) refers to the ease with which pores in a saturated soil transmit water. The estimates in the table are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity (*K_{sat}*) is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause

damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil.

Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (K_w and K_f) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and K_{sat} . Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor K_w indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor K_f indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook."

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Reference:

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. (<http://soils.usda.gov>)

Custom Soil Resource Report

Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
24—Burch-Quencheroo-Dryck complex, 0 to 2 percent slopes														
Burch	0-13	-42-	-38-	15-20- 25	1.35-1.40-1.45	4.00-23.29-42.34	0.12-0.15-0.17	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.37	.37	5	6	48
	13-21	-30-	-55-	13-16- 18	1.25-1.30-1.35	4.00-9.00-14.11	0.14-0.17-0.20	0.0- 1.5- 2.9	0.5- 0.8- 1.0	.49	.49			
	21-60	-63-	-24-	10-13- 16	1.40-1.48-1.55	4.00-23.29-42.34	0.12-0.14-0.16	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.49	.49			
Quencheroo	0-8	-42-	-38-	16-20- 24	1.30-1.35-1.40	4.00-9.00-14.11	0.14-0.17-0.20	0.0- 1.5- 2.9	2.0- 2.5- 3.0	.37	.37	3	6	48
	8-14	-37-	-36-	24-27- 31	1.25-1.35-1.45	1.41-2.82-4.23	0.12-0.15-0.18	3.0- 4.5- 5.9	1.0- 1.5- 2.0	.32	.32			
	14-27	-37-	-36-	24-27- 31	1.20-1.30-1.40	1.41-2.82-4.23	0.12-0.15-0.18	3.0- 4.5- 5.9	1.0- 1.5- 2.0	.32	.32			
	27-56	-26-	-53-	16-21- 25	1.20-1.30-1.40	4.00-9.00-14.11	0.12-0.15-0.18	0.0- 1.5- 2.9	0.7- 0.9- 1.0	.43	.43			
	56-66	—	—	—	—	—	—	—	—					
Dryck	0-8	-61-	-24-	12-15- 18	1.35-1.40-1.45	4.00-23.29-42.34	0.12-0.15-0.17	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.37	.37	3	3	86
	8-23	-61-	-24-	12-15- 18	1.35-1.40-1.45	4.00-23.29-42.34	0.11-0.14-0.17	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.43	.43			
	23-28	-96-	- 1-	1- 4- 6	1.35-1.43-1.50	42.00-91.74-141.14	0.08-0.10-0.11	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.02	.02			
	28-60	-90-	- 6-	0- 4- 8	1.60-1.65-1.70	42.34-91.74-141.14	0.03-0.04-0.05	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.02	.02			

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
27—Catchell-Gooding complex, 2 to 6 percent slopes														
Catchell	0-6	-26-	-52-	18-22- 25	1.40-1.45-1.50	4.00-9.00-14.11	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.17	.49	2	8	0
	6-21	-28-	-29-	35-43- 50	1.40-1.45-1.50	0.00-0.21-0.42	0.14-0.15-0.16	6.0- 7.5- 8.9	0.5- 1.3- 2.0	.28	.28			
	21-26	-12-	-58-	10-30- 30	1.50-1.55-1.60	4.00-9.00-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.49	.49			
	26-30	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	30-40	—	—	—	—	—	—	—	—					
Gooding	0-10	-25-	-53-	20-23- 25	1.20-1.30-1.40	1.41-2.82-4.23	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.43	.43	3	6	48
	10-45	- 6-	-57-	35-37- 59	1.35-1.45-1.55	0.00-0.21-0.42	0.14-0.18-0.21	6.0- 7.5- 8.9	0.7- 0.9- 1.0	.43	.43			
	45-54	-30-	-45-	25-26- 40	1.25-1.38-1.50	0.42-0.92-1.41	0.14-0.18-0.21	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	54-59	-30-	-45-	25-26- 40	1.25-1.38-1.50	0.01-0.22-0.42	0.00-0.00-0.00	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	59-69	—	—	—	—	—	—	—	—					

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
28—Catchell-Gooding complex, 6 to 20 percent slopes														
Catchell	0-6	-26-	-52-	18-22- 25	1.40-1.45-1.50	4.00-9.00-14.11	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.17	.49	2	8	0
	6-21	-28-	-29-	35-43- 50	1.40-1.45-1.50	0.00-0.21-0.42	0.14-0.15-0.16	6.0- 7.5- 8.9	0.5- 1.3- 2.0	.28	.28			
	21-26	-12-	-61-	10-27- 30	1.50-1.55-1.60	4.00-9.00-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.55	.55			
	26-30	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	30-40	—	—	—	—	—	—	—	—					
Gooding	0-10	-25-	-53-	20-23- 25	1.20-1.30-1.40	1.41-2.82-4.23	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.43	.43	3	6	48
	10-45	- 6-	-57-	35-37- 59	1.35-1.45-1.55	0.00-0.21-0.42	0.14-0.18-0.21	6.0- 7.5- 8.9	0.7- 0.9- 1.0	.43	.43			
	45-54	-30-	-45-	25-26- 40	1.25-1.38-1.50	0.42-0.92-1.41	0.14-0.18-0.21	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	54-59	-30-	-45-	25-26- 40	1.25-1.38-1.50	0.01-0.22-0.42	0.00-0.00-0.00	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	59-69	—	—	—	—	—	—	—	—					

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
47—Elijah-Gooding complex, 0 to 3 percent slopes														
Elijah	0-5	-14-	-70-	12-16- 20	1.50-1.55-1.60	4.00-9.00-14.11	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.49	.49	2	5	56
	5-15	- 7-	-63-	26-31- 35	1.40-1.45-1.50	1.41-2.82-4.23	0.19-0.20-0.21	3.0- 4.5- 5.9	0.7- 0.9- 1.0	.43	.43			
	15-31	-12-	-69-	12-19- 26	1.50-1.55-1.60	4.00-9.00-14.11	0.16-0.19-0.21	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.64	.64			
	31-45	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	45-55	—	—	—	—	—	—	—	—					
Gooding	0-10	-25-	-53-	20-23- 25	1.20-1.30-1.40	1.41-2.82-4.23	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.43	.43	3	6	48
	10-45	- 6-	-57-	35-37- 59	1.35-1.45-1.55	0.00-0.21-0.42	0.14-0.18-0.21	6.0- 7.5- 8.9	0.7- 0.9- 1.0	.43	.43			
	45-54	-30-	-45-	25-26- 40	1.25-1.38-1.50	0.42-0.92-1.41	0.14-0.18-0.21	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	54-59	-30-	-45-	25-26- 40	1.25-1.38-1.50	0.01-0.22-0.42	0.00-0.00-0.00	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	59-69	—	—	—	—	—	—	—	—					

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/in</i>	<i>Pct</i>	<i>Pct</i>					
69—Gooding silt loam, 0 to 3 percent slopes														
Gooding	0-10	-25-	-53-	20-23- 25	1.20-1.30-1.40	1.41-2.82-4.23	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.43	.43	3	6	48
	10-45	- 6-	-57-	35-37- 59	1.35-1.45-1.55	0.00-0.21-0.42	0.14-0.18-0.21	6.0- 7.5- 8.9	0.7- 0.9- 1.0	.43	.43			
	45-54	-40-	-35-	25-26- 40	1.25-1.38-1.50	0.42-0.92-1.41	0.14-0.18-0.21	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	54-59	-40-	-35-	25-26- 40	1.25-1.38-1.50	0.01-0.22-0.42	0.00-0.00-0.00	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	59-69	—	—	—	—	—	—	—	—					

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
74—Gooding-Power complex, 0 to 2 percent slopes														
Gooding	0-10	-25-	-53-	20-23- 25	1.20-1.30-1.40	1.41-2.82-4.23	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.43	.43	3	6	48
	10-45	- 6-	-57-	35-37- 59	1.35-1.45-1.55	0.00-0.21-0.42	0.14-0.18-0.21	6.0- 7.5- 8.9	0.7- 0.9- 1.0	.43	.43			
	45-54	-40-	-35-	25-26- 40	1.25-1.38-1.50	0.42-0.92-1.41	0.14-0.18-0.21	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	54-59	-40-	-35-	25-26- 40	1.25-1.38-1.50	0.01-0.22-0.42	0.00-0.00-0.00	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	59-69	—	—	—	—	—	—	—	—					
Power	0-6	-11-	-69-	18-20- 22	1.30-1.40-1.50	4.00-9.00-14.11	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.43	.43	5	6	48
	6-40	- 7-	-74-	14-20- 35	1.20-1.35-1.50	1.41-2.82-4.23	0.16-0.19-0.21	3.0- 4.5- 5.9	0.5- 0.8- 1.0	.55	.55			
	40-64	-61-	-22-	15-18- 20	1.35-1.45-1.55	4.00-9.00-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.55	.55			

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
75— Haploxerolls- Camborthids- Rock outcrop complex, 1 to 3 percent slopes														
Haploxerolls	0-16	-45-	-42-	7-14- 20	1.35-1.43- 1.50	4.00-23.29-42.3 4	0.08-0.13-0.1 7	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.28	.28	2	5	56
	16-60	-90-	- 6-	0- 4- 8	1.60-1.65- 1.70	42.34-91.74-14 1.14	0.03-0.04-0.0 5	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.02	.02			
Camborthids	0-14	-84-	- 9-	5- 8- 10	1.35-1.48- 1.60	4.00-72.69-141. 14	0.07-0.09-0.1 0	0.0- 1.5- 2.9	0.5- 0.8- 1.0	.28	.28	1	2	134
	14-17	-66-	-19-	13-15- 17	1.25-1.33- 1.40	4.00-9.00-14.11	0.12-0.15-0.1 7	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.32	.32			
	17-27	—	—	—	—	—	—	—	—					
Rock outcrop	0-60	—	—	—	—	—	—	—	—					
106—Lava flows-Lithic Torriorthents complex, 2 to 8 percent slopes														
Lava flows	0-60	—	—	—	—	—	—	—	—					
Lithic torriorthents	0-2	-30-	-55-	10-15- 20	1.25-1.35- 1.45	4.00-23.29-42.3 4	0.10-0.12-0.1 3	0.0- 1.5- 2.9	0.5- 0.8- 1.0	.20	.49	1	7	38
	2-9	-30-	-55-	10-15- 20	1.25-1.35- 1.45	4.00-23.29-42.3 4	0.10-0.12-0.1 3	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.32	.55			
	9-19	—	—	—	—	—	—	—	—					

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
147—Power silt loam, 0 to 3 percent slopes														
Power	0-10	-11-	-69-	18-20- 22	1.30-1.40-1.50	4.00-9.00-14.11	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.43	.43	5	6	48
	10-40	- 7-	-67-	24-27- 35	1.20-1.35-1.50	1.41-2.82-4.23	0.16-0.19-0.21	3.0- 4.5- 5.9	0.5- 0.8- 1.0	.49	.49			
	40-64	-61-	-22-	15-18- 20	1.35-1.45-1.55	4.00-9.00-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.55	.55			
206—Vining-Kecko-Rock outcrop complex, 2 to 12 percent slopes														
Vining	0-6	-63-	-26-	6-11- 15	1.35-1.45-1.55	14.11-28.23-42.34	0.10-0.12-0.14	0.0- 1.5- 2.9	0.7- 0.9- 1.0	.28	.28	2	3	86
	6-20	-67-	-20-	7-13- 18	1.40-1.50-1.60	14.11-28.23-42.34	0.09-0.11-0.12	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.37	.37			
	20-24	-74-	-19-	4- 7- 10	1.25-1.33-1.40	42.34-91.74-141.14	0.07-0.09-0.10	0.0- 1.5- 2.9	0.0- 0.1- 0.2	.37	.37			
	24-34	—	—	—	—	—	—	—	—					
Kecko	0-5	-78-	-16-	3- 6- 8	1.40-1.50-1.60	42.00-91.74-141.14	0.08-0.09-0.10	0.0- 1.5- 2.9	0.5- 0.8- 1.0	.24	.24	5	2	134
	5-30	-66-	-20-	10-14- 18	1.25-1.38-1.50	14.11-28.23-42.34	0.13-0.14-0.15	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.17	.17			
	30-60	-55-	-31-	10-14- 18	1.20-1.30-1.40	4.00-9.00-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.37	.37			
Rock outcrop	0-60	—	—	—	—	—	—	—	—					

Water Features

This folder contains tabular reports that present soil hydrology information. The reports (tables) include all selected map units and components for each map unit. Water Features include ponding frequency, flooding frequency, and depth to water table.

Water Features (North Farm)

This table gives estimates of various soil water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

Surface runoff refers to the loss of water from an area by flow over the land surface. Surface runoff classes are based on slope, climate, and vegetative cover. The concept indicates relative runoff for very specific conditions. It is assumed that the surface of the soil is bare and that the retention of surface water resulting from irregularities in the ground surface is minimal. The classes are negligible, very low, low, medium, high, and very high.

The *months* in the table indicate the portion of the year in which a water table, ponding, and/or flooding is most likely to be a concern.

Water table refers to a saturated zone in the soil. The water features table indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on

observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table. The kind of water table, apparent or perched, is given if a seasonal high water table exists in the soil. A water table is perched if free water is restricted from moving downward in the soil by a restrictive feature, in most cases a hardpan; there is a dry layer of soil underneath a wet layer. A water table is apparent if free water is present in all horizons from its upper boundary to below 2 meters or to the depth of observation. The water table kind listed is for the first major component in the map unit.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. The table indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Duration and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and *very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Custom Soil Resource Report

Map unit symbol and soil name	Hydrologic group	Surface runoff	Most likely months	Water table			Ponding			Flooding	
				Upper limit	Lower limit	Kind	Surface depth	Duration	Frequency	Duration	Frequency
				<i>Ft</i>	<i>Ft</i>		<i>Ft</i>				
24—Burch-Quencherero-Dryck complex, 0 to 2 percent slopes											
Burch	B		Jan-Dec	—	—	—	—	—	None	—	None
Quencherero	C		Jan-Dec	—	—	—	—	—	None	—	None
Dryck	A		Jan-Dec	—	—	—	—	—	None	—	None
27—Catchell-Gooding complex, 2 to 6 percent slopes											
Catchell	D		Jan-Dec	—	—	—	—	—	None	—	None
Gooding	D		Jan-Dec	—	—	—	—	—	None	—	None
28—Catchell-Gooding complex, 6 to 20 percent slopes											
Catchell	D		Jan-Dec	—	—	—	—	—	None	—	None
Gooding	D		Jan-Dec	—	—	—	—	—	None	—	None
47—Elijah-Gooding complex, 0 to 3 percent slopes											
Elijah	C		Jan-Dec	—	—	—	—	—	None	—	None
Gooding	D		Jan-Dec	—	—	—	—	—	None	—	None
69—Gooding silt loam, 0 to 3 percent slopes											
Gooding	D		Jan-Dec	—	—	—	—	—	None	—	None
74—Gooding-Power complex, 0 to 2 percent slopes											
Gooding	D		Jan-Dec	—	—	—	—	—	None	—	None
Power	C		Jan-Dec	—	—	—	—	—	None	—	None

Custom Soil Resource Report

Map unit symbol and soil name	Hydrologic group	Surface runoff	Most likely months	Water table			Ponding			Flooding	
				Upper limit	Lower limit	Kind	Surface depth	Duration	Frequency	Duration	Frequency
				<i>Ft</i>	<i>Ft</i>		<i>Ft</i>				
75—Haploxerolls-Camborthids-Rock outcrop complex, 1 to 3 percent slopes											
Haploxerolls	A		Jan-Feb	—	—	—	—	—	None	—	None
			Mar-May	—	—	—	—	—	None	Long (7 to 30 days)	Occasional
			Jun-Dec	—	—	—	—	—	None	—	None
Camborthids	D		Jan-Feb	—	—	—	—	—	None	—	None
			Mar-May	—	—	—	—	—	None	Long (7 to 30 days)	Occasional
			Jun-Dec	—	—	—	—	—	None	—	None
Rock outcrop			Jan-Dec	—	—	—	—	—	None	—	None
106—Lava flows-Lithic Torriorthents complex, 2 to 8 percent slopes											
Lava flows			Jan-Dec	—	—	—	—	—	None	—	None
Lithic torriorthents	D		Jan-Dec	—	—	—	—	—	None	—	None
147—Power silt loam, 0 to 3 percent slopes											
Power	C		Jan-Dec	—	—	—	—	—	None	—	None
206—Vining-Kecko-Rock outcrop complex, 2 to 12 percent slopes											
Vining	B		Jan-Dec	—	—	—	—	—	None	—	None
Kecko	B		Jan-Dec	—	—	—	—	—	None	—	None
Rock outcrop			Jan-Dec	—	—	—	—	—	None	—	None

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Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties

Four Brothers Low Farm



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

Preface	2
How Soil Surveys Are Made	5
Soil Map	8
Soil Map (Low Farm).....	9
Legend.....	10
Map Unit Legend (Low Farm).....	11
Map Unit Descriptions (Low Farm).....	11
Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties.....	13
24—Burch-Quencheroo-Dryck complex, 0 to 2 percent slopes.....	13
151—Quencheroo-Loupence complex, 0 to 1 percent slopes.....	15
171—Snowmore-Besslen-Hoosegow complex, 1 to 4 percent slopes.....	16
177—Snowmore-Wako-Harsan complex, 1 to 4 percent slopes.....	19
183—Starbuck-Sidlake-Rock outcrop complex, 2 to 15 percent slopes.....	21
212—Wendell-Ackelton complex, 1 to 4 percent slopes.....	23
Soil Information for All Uses	25
Soil Reports.....	25
Soil Physical Properties.....	25
Physical Soil Properties (Low Farm).....	25
Water Features.....	35
Water Features (Low Farm).....	35
References	38

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

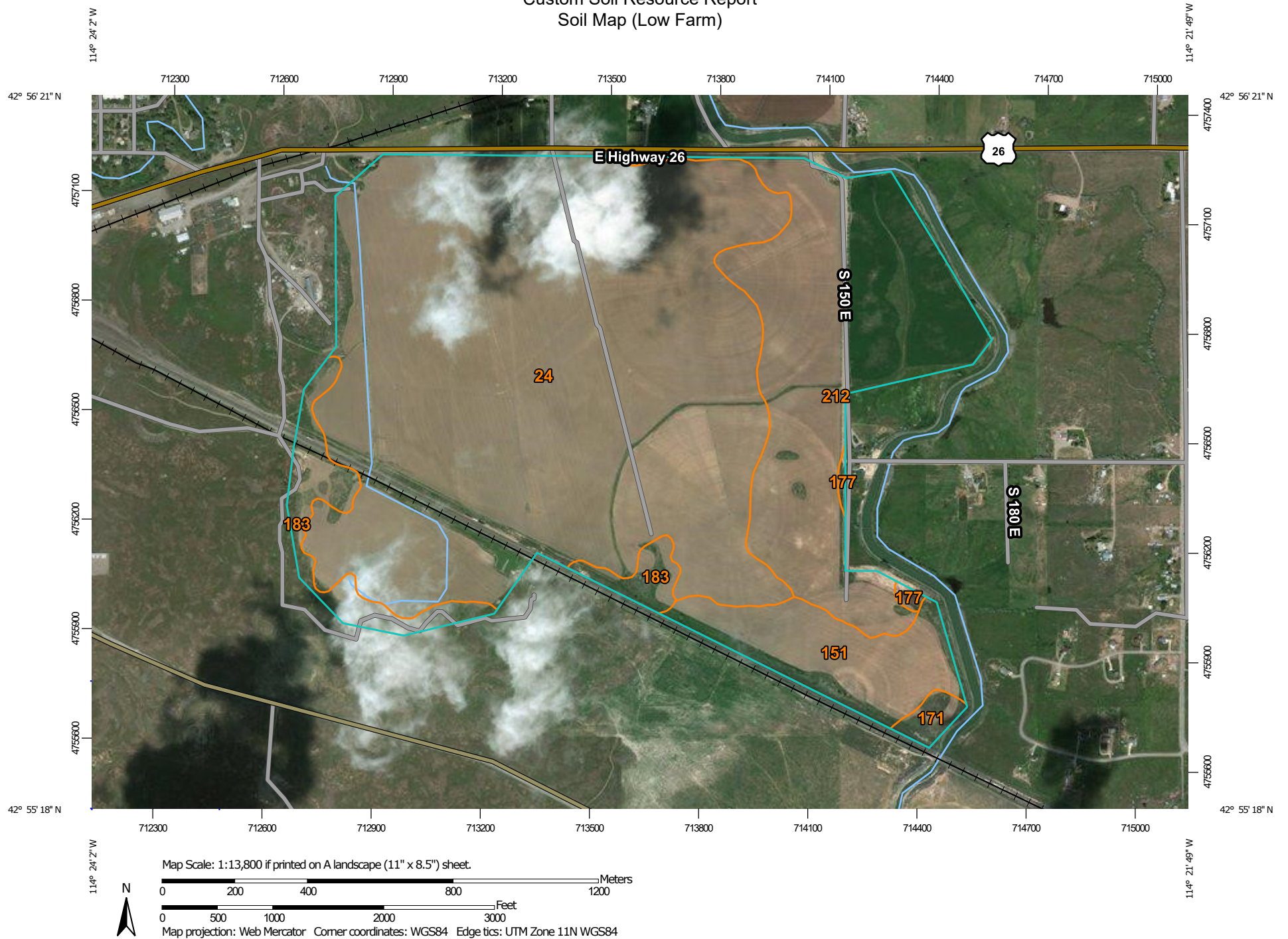
Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map (Low Farm)



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit

 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water

 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot

 Sinkhole

 Slide or Slip

 Sodic Spot

 Spoil Area

 Stony Spot

 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

Water Features

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Wood River Area, Idaho, Gooding County and

Parts of Blaine, Lincoln, and Minidoka Counties

Survey Area Data: Version 17, Jun 4, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 14, 2012—Nov 8, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (Low Farm)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
24	Burch-Quencheroo-Dryck complex, 0 to 2 percent slopes	342.7	64.7%
151	Quencheroo-Loupence complex, 0 to 1 percent slopes	36.6	6.9%
171	Snowmore-Besslen-Hoosegow complex, 1 to 4 percent slopes	4.1	0.8%
177	Snowmore-Wako-Harsan complex, 1 to 4 percent slopes	1.7	0.3%
183	Starbuck-Sidlake-Rock outcrop complex, 2 to 15 percent slopes	26.7	5.0%
212	Wendell-Ackelton complex, 1 to 4 percent slopes	117.7	22.2%
Totals for Area of Interest		529.5	100.0%

Map Unit Descriptions (Low Farm)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a

given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties

24—Burch-Quencheroo-Dryck complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2r8s
Elevation: 3,500 to 4,600 feet
Mean annual precipitation: 8 to 13 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 100 to 120 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Burch and similar soils: 45 percent
Quencheroo and similar soils: 30 percent
Dryck and similar soils: 15 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Burch

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

Ap - 0 to 13 inches: loam
Bw - 13 to 21 inches: silt loam
Bk - 21 to 60 inches: very fine sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water capacity: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): 2c
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Quencheroo

Setting

Landform: Stream terraces

Custom Soil Resource Report

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium over bedrock derived from basalt

Typical profile

A - 0 to 8 inches: loam

Bw1 - 8 to 14 inches: loam

Bw2 - 14 to 27 inches: loam

C - 27 to 56 inches: silt loam

R - 56 to 66 inches: bedrock

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: 40 to 60 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Moderate (about 8.5 inches)

Interpretive groups

Land capability classification (irrigated): 2c

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: C

Hydric soil rating: No

Description of Dryck

Setting

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium

Typical profile

Ap - 0 to 8 inches: very fine sandy loam

Bw - 8 to 23 inches: very fine sandy loam

2C1 - 23 to 28 inches: fine sand

2C2 - 28 to 60 inches: very gravelly sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 6.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: A

Hydric soil rating: No

Minor Components

Aquolls

Percent of map unit: 5 percent

Landform: Flood plains

Hydric soil rating: Yes

151—Quencheroo-Loupence complex, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2r6d

Elevation: 3,500 to 4,200 feet

Mean annual precipitation: 8 to 11 inches

Mean annual air temperature: 46 to 52 degrees F

Frost-free period: 100 to 120 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Quencheroo and similar soils: 65 percent

Loupence and similar soils: 20 percent

Minor components: 5 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Quencheroo

Setting

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium over bedrock derived from basalt

Typical profile

A - 0 to 5 inches: silt loam

Bw1 - 5 to 11 inches: loam

Bw2 - 11 to 21 inches: loam

C1 - 21 to 30 inches: silt loam

C2 - 30 to 49 inches: silt loam

R - 49 to 59 inches: bedrock

Properties and qualities

Slope: 0 to 1 percent

Depth to restrictive feature: 40 to 60 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Custom Soil Resource Report

Frequency of ponding: None

Available water capacity: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): 2e

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: C

Hydric soil rating: No

Description of Loupence

Setting

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium

Typical profile

Ap - 0 to 5 inches: silt loam

Bw1 - 5 to 28 inches: silty clay loam

Bw2 - 28 to 42 inches: very fine sandy loam

Bw3 - 42 to 67 inches: silty clay loam

Properties and qualities

Slope: 0 to 1 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: High (about 10.9 inches)

Interpretive groups

Land capability classification (irrigated): 2e

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: C

Hydric soil rating: No

Minor Components

Aquolls

Percent of map unit: 5 percent

Landform: Flood plains

Hydric soil rating: Yes

171—Snowmore-Besslen-Hoosegow complex, 1 to 4 percent slopes

Map Unit Setting

National map unit symbol: 2r73

Custom Soil Resource Report

Elevation: 3,300 to 4,600 feet
Mean annual precipitation: 8 to 12 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 90 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Snowmore and similar soils: 40 percent
Besslen and similar soils: 35 percent
Hoosegow and similar soils: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Snowmore

Setting

Landform: Hills, buttes
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Volcanic ash and/or mixed alluvium and/or loess over bedrock derived from rhyolite and/or basalt

Typical profile

A - 0 to 9 inches: loam
Bt - 9 to 21 inches: loam
Bk - 21 to 26 inches: sandy clay loam
Bkqm - 26 to 39 inches: cemented material
R - 39 to 49 inches: bedrock

Properties and qualities

Slope: 1 to 4 percent
Depth to restrictive feature: 20 to 34 inches to duripan; 21 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 12.0
Available water capacity: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Ecological site: R011XY001ID - LOAMY 8-12 - Provisional
Hydric soil rating: No

Description of Besslen

Setting

Landform: Buttes
Landform position (two-dimensional): Summit
Down-slope shape: Linear

Custom Soil Resource Report

Across-slope shape: Linear

Parent material: Silty alluvium and/or loess over bedrock derived from basalt

Typical profile

A - 0 to 2 inches: loam

Bkq - 2 to 13 inches: loam

2Bkq - 13 to 19 inches: gravelly sandy loam

2Bkqm - 19 to 38 inches: cemented material

2R - 38 to 48 inches: bedrock

Properties and qualities

Slope: 1 to 4 percent

Depth to restrictive feature: 10 to 20 inches to duripan; 24 to 40 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 40 percent

Maximum salinity: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)

Available water capacity: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 6s

Hydrologic Soil Group: D

Ecological site: R011XY001ID - LOAMY 8-12 - Provisional

Hydric soil rating: No

Description of Hoosegow

Setting

Landform: Buttes, depressions, drainageways

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium

Typical profile

A1 - 0 to 7 inches: loam

A2 - 7 to 25 inches: loam

Bt - 25 to 41 inches: sandy clay loam

BC - 41 to 50 inches: fine sandy loam

C - 50 to 60 inches: fine sandy loam

Properties and qualities

Slope: 1 to 4 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 3 percent

Available water capacity: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: B

Ecological site: R011XY015ID - LOAMY BOTTOM 8-14 ARTRT/LECI4

Hydric soil rating: No

177—Snowmore-Wako-Harsan complex, 1 to 4 percent slopes

Map Unit Setting

National map unit symbol: 2r79

Elevation: 3,200 to 5,400 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 90 to 140 days

Farmland classification: Prime farmland if irrigated and reclaimed of excess salts and sodium

Map Unit Composition

Snowmore and similar soils: 50 percent

Wako and similar soils: 20 percent

Harsan and similar soils: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Snowmore

Setting

Landform: Lava fields, buttes

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Volcanic ash and/or mixed alluvium and/or loess over bedrock derived from rhyolite and/or basalt

Typical profile

A - 0 to 6 inches: sandy loam

Bt - 6 to 18 inches: sandy clay loam

Bk - 18 to 22 inches: gravelly loam

Bkqm - 22 to 33 inches: cemented material

R - 33 to 43 inches: bedrock

Properties and qualities

Slope: 1 to 4 percent

Depth to restrictive feature: 20 to 34 inches to duripan; 21 to 40 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Custom Soil Resource Report

Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 12.0
Available water capacity: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Ecological site: R011XY001ID - LOAMY 8-12 - Provisional
Hydric soil rating: No

Description of Wako

Setting

Landform: Lava plains, buttes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits over bedrock derived from volcanic rock

Typical profile

Ap - 0 to 9 inches: sandy loam
Bt - 9 to 31 inches: clay loam
2Bkq - 31 to 34 inches: sandy clay loam
2Bkqm - 34 to 44 inches: cemented material
2R - 44 to 54 inches: bedrock

Properties and qualities

Slope: 1 to 4 percent
Depth to restrictive feature: 24 to 40 inches to duripan; 40 to 60 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 40 percent
Maximum salinity: Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 6.0
Available water capacity: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Ecological site: R011XY001ID - LOAMY 8-12 - Provisional
Hydric soil rating: No

Description of Harsan

Setting

Landform: Lava fields, buttes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium and/or eolian deposits

Typical profile

A - 0 to 18 inches: fine sandy loam
Bt - 18 to 35 inches: sandy clay loam
Btk - 35 to 51 inches: loam
Bkqm - 51 to 60 inches: cemented material

Properties and qualities

Slope: 1 to 4 percent
Depth to restrictive feature: 40 to 60 inches to duripan
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Ecological site: R011XA009ID - LOAMY 8-12 ARTRT/PSSPS
Hydric soil rating: No

183—Starbuck-Sidlake-Rock outcrop complex, 2 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2r7j
Elevation: 2,900 to 4,700 feet
Mean annual precipitation: 8 to 12 inches
Mean annual air temperature: 45 to 54 degrees F
Frost-free period: 95 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Starbuck and similar soils: 35 percent
Sidlake and similar soils: 25 percent
Rock outcrop: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Starbuck

Setting

Landform: Lava fields
Down-slope shape: Linear
Across-slope shape: Linear

Custom Soil Resource Report

Parent material: Mixed alluvium and/or eolian deposits over bedrock derived from basalt

Typical profile

A - 0 to 3 inches: fine sandy loam
Bw - 3 to 16 inches: loam
R - 16 to 26 inches: bedrock

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: 12 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R011XA003ID - SHALLOW LOAMY 8-12 ARTTRT/PSSPS
Hydric soil rating: No

Description of Sidlake

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium and/or loess over bedrock derived from volcanic rock

Typical profile

A1 - 0 to 3 inches: fine sandy loam
A2 - 3 to 8 inches: loam
Bt1 - 8 to 18 inches: sandy clay loam
Bt2 - 18 to 24 inches: loam
R - 24 to 34 inches: bedrock

Properties and qualities

Slope: 2 to 12 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: C

Ecological site: R011XA009ID - LOAMY 8-12 ARTRT/PSSPS

Hydric soil rating: No

Description of Rock Outcrop

Typical profile

R - 0 to 60 inches: bedrock

Properties and qualities

Slope: 2 to 15 percent

Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8

Hydric soil rating: Unranked

212—Wendell-Ackelton complex, 1 to 4 percent slopes

Map Unit Setting

National map unit symbol: 2r8l

Elevation: 3,200 to 4,200 feet

Mean annual precipitation: 9 to 11 inches

Mean annual air temperature: 48 to 52 degrees F

Frost-free period: 100 to 120 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Wendell and similar soils: 50 percent

Ackelton and similar soils: 30 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wendell

Setting

Landform: Lava fields

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Eolian deposits over bedrock derived from volcanic rock

Typical profile

A - 0 to 8 inches: fine sandy loam

Bt - 8 to 19 inches: loam

Bkq - 19 to 32 inches: loam

Bkqm - 32 to 39 inches: cemented material

R - 39 to 49 inches: bedrock

Properties and qualities

Slope: 1 to 4 percent

Custom Soil Resource Report

Depth to restrictive feature: 22 to 36 inches to duripan; 26 to 39 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 15 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water capacity: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: C

Hydric soil rating: No

Description of Ackelton

Setting

Landform: Lava fields

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Eolian deposits

Typical profile

Ap - 0 to 11 inches: fine sandy loam

Bt - 11 to 39 inches: sandy clay loam

2Bkq - 39 to 53 inches: loam

2Bkqm - 53 to 62 inches: cemented material

3Bkq - 62 to 76 inches: loamy very fine sand

Properties and qualities

Slope: 1 to 4 percent

Depth to restrictive feature: 43 to 58 inches to duripan

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 40 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water capacity: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: B

Hydric soil rating: No

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Physical Soil Properties (Low Farm)

This table shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is

given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity (*K_{sat}*), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity (K_{sat}) refers to the ease with which pores in a saturated soil transmit water. The estimates in the table are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity (*K_{sat}*) is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause

damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil.

Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (K_w and K_f) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and K_{sat} . Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor K_w indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor K_f indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook."

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Reference:

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. (<http://soils.usda.gov>)

Custom Soil Resource Report

Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/in</i>	<i>Pct</i>	<i>Pct</i>					
24—Burch-Quencheroo-Dryck complex, 0 to 2 percent slopes														
Burch	0-13	-42-	-38-	15-20- 25	1.35-1.40-1.45	4.00-23.29-42.34	0.12-0.15-0.17	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.37	.37	5	6	48
	13-21	-30-	-55-	13-16- 18	1.25-1.30-1.35	4.00-9.00-14.11	0.14-0.17-0.20	0.0- 1.5- 2.9	0.5- 0.8- 1.0	.49	.49			
	21-60	-63-	-24-	10-13- 16	1.40-1.48-1.55	4.00-23.29-42.34	0.12-0.14-0.16	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.49	.49			
Quencheroo	0-8	-42-	-38-	16-20- 24	1.30-1.35-1.40	4.00-9.00-14.11	0.14-0.17-0.20	0.0- 1.5- 2.9	2.0- 2.5- 3.0	.37	.37	3	6	48
	8-14	-37-	-36-	24-27- 31	1.25-1.35-1.45	1.41-2.82-4.23	0.12-0.15-0.18	3.0- 4.5- 5.9	1.0- 1.5- 2.0	.32	.32			
	14-27	-37-	-36-	24-27- 31	1.20-1.30-1.40	1.41-2.82-4.23	0.12-0.15-0.18	3.0- 4.5- 5.9	1.0- 1.5- 2.0	.32	.32			
	27-56	-26-	-53-	16-21- 25	1.20-1.30-1.40	4.00-9.00-14.11	0.12-0.15-0.18	0.0- 1.5- 2.9	0.7- 0.9- 1.0	.43	.43			
	56-66	—	—	—	—	—	—	—	—					
Dryck	0-8	-61-	-24-	12-15- 18	1.35-1.40-1.45	4.00-23.29-42.34	0.12-0.15-0.17	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.37	.37	3	3	86
	8-23	-61-	-24-	12-15- 18	1.35-1.40-1.45	4.00-23.29-42.34	0.11-0.14-0.17	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.43	.43			
	23-28	-96-	- 1-	1- 4- 6	1.35-1.43-1.50	42.00-91.74-141.14	0.08-0.10-0.11	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.02	.02			
	28-60	-90-	- 6-	0- 4- 8	1.60-1.65-1.70	42.34-91.74-141.14	0.03-0.04-0.05	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.02	.02			

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/in</i>	<i>Pct</i>	<i>Pct</i>					
151— Quencheroo-Loupence complex, 0 to 1 percent slopes														
Quencheroo	0-5	-27-	-54-	16-20- 24	1.30-1.35-1.40	4.00-9.00-14.11	0.14-0.17-0.20	0.0- 1.5- 2.9	2.0- 2.5- 3.0	.43	.43	3	6	48
	5-11	-37-	-36-	24-27- 31	1.25-1.35-1.45	1.41-2.82-4.23	0.12-0.15-0.18	3.0- 4.5- 5.9	1.0- 1.5- 2.0	.32	.32			
	11-21	-37-	-36-	24-27- 31	1.20-1.30-1.40	1.41-2.82-4.23	0.12-0.15-0.18	3.0- 4.5- 5.9	1.0- 1.5- 2.0	.32	.32			
	21-30	-26-	-53-	16-21- 25	1.20-1.30-1.40	4.00-9.00-14.11	0.12-0.15-0.18	0.0- 1.5- 2.9	0.7- 0.9- 1.0	.43	.43			
	30-49	-22-	-58-	16-21- 25	1.30-1.40-1.50	4.00-9.00-14.11	0.09-0.13-0.17	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.55	.55			
	49-59	—	—	—	—	—	—	—	—					
Loupence	0-5	-11-	-69-	18-20- 22	1.25-1.35-1.45	4.00-9.00-14.11	0.18-0.19-0.20	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.43	.43	5	6	48
	5-28	-10-	-58-	18-33- 40	1.20-1.30-1.40	1.41-2.82-4.23	0.18-0.19-0.20	3.0- 4.5- 5.9	1.0- 1.5- 2.0	.37	.37			
	28-42	-55-	-27-	15-18- 38	1.20-1.30-1.40	1.41-2.82-4.23	0.17-0.18-0.19	3.0- 4.5- 5.9	0.7- 0.9- 1.0	.43	.43			
	42-67	-17-	-52-	14-31- 38	1.20-1.30-1.40	4.00-9.00-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.37	.37			

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/in</i>	<i>Pct</i>	<i>Pct</i>					
171— Snowmore-Besslen-Hoosegow complex, 1 to 4 percent slopes														
Snowmore	0-9	-43-	-39-	15-19- 22	1.30-1.35-1.40	4.00-9.00-14.11	0.15-0.17-0.18	0.0- 1.5- 2.9	0.5- 0.8- 1.0	.32	.32	2	5	56
	9-21	-39-	-37-	20-25- 29	1.30-1.35-1.40	1.41-7.76-14.11	0.15-0.17-0.19	3.0- 4.5- 5.9	0.0- 0.3- 0.5	.43	.43			
	21-26	-60-	-18-	20-23- 25	1.20-1.25-1.30	4.00-9.00-14.11	0.15-0.17-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.32	.32			
	26-39	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	39-49	—	—	—	—	—	—	—	—					
Besslen	0-2	-45-	-41-	10-14- 18	1.20-1.30-1.40	4.00-9.00-14.11	0.13-0.16-0.18	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.37	.37	1	4L	86
	2-13	-40-	-46-	10-14- 18	1.20-1.30-1.40	4.00-9.00-14.11	0.10-0.15-0.19	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.49	.49			
	13-19	-55-	-31-	10-14- 18	1.20-1.30-1.40	4.00-9.00-14.11	0.09-0.12-0.15	0.0- 1.5- 2.9	0.5- 0.8- 1.0	.24	.37			
	19-38	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	38-48	—	—	—	—	—	—	—	—					
Hoosegow	0-7	-46-	-42-	10-13- 15	1.45-1.50-1.55	4.00-9.00-14.11	0.13-0.16-0.19	0.0- 1.5- 2.9	0.8- 0.9- 1.0	.43	.43	5	5	56
	7-25	-44-	-40-	14-16- 18	1.50-1.58-1.65	4.00-9.00-14.11	0.10-0.15-0.19	0.0- 1.5- 2.9	0.5- 0.8- 1.0	.43	.43			
	25-41	-59-	-17-	20-24- 27	1.55-1.60-1.65	4.00-9.00-14.11	0.13-0.17-0.20	3.0- 4.5- 5.9	0.5- 0.8- 1.0	.24	.24			

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/in</i>	<i>Pct</i>	<i>Pct</i>					
	41-50	-56-	-32-	10-13- 15	1.50-1.55- 1.60	14.11-28.23-42. 34	0.10-0.15-0.1 9	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.37	.37			
	50-60	-65-	-27-	5- 8- 10	1.55-1.60- 1.65	42.00-91.74-14 1.14	0.08-0.11-0.1 4	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.24	.24			

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
177— Snowmore-Wako-Harsan complex, 1 to 4 percent slopes														
Snowmore	0-6	-67-	-15-	15-18- 20	1.30-1.40-1.50	4.00-9.00-14.11	0.13-0.14-0.15	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.15	.15	2	3	86
	6-18	-59-	-17-	20-25- 30	1.25-1.35-1.45	1.41-2.82-4.23	0.17-0.18-0.19	3.0- 4.5- 5.9	0.5- 1.3- 2.0	.28	.28			
	18-22	-36-	-39-	15-25- 35	1.40-1.50-1.60	1.41-2.82-4.23	0.17-0.18-0.19	3.0- 4.5- 5.9	0.5- 0.8- 1.0	.24	.43			
	22-33	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	33-43	—	—	—	—	—	—	—	—					
Wako	0-9	-66-	-23-	8-11- 14	1.30-1.40-1.50	14.11-28.23-42.34	0.10-0.12-0.14	0.0- 1.5- 2.9	0.7- 0.9- 1.0	.20	.20	2	3	86
	9-31	-35-	-37-	22-28- 32	1.20-1.30-1.40	1.41-2.82-4.23	0.14-0.15-0.16	3.0- 4.5- 5.9	0.0- 0.3- 0.5	.37	.37			
	31-34	-61-	-18-	17-21- 25	1.25-1.35-1.45	4.00-9.00-14.11	0.10-0.11-0.12	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.32	.32			
	34-44	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	44-54	—	—	—	—	—	—	—	—					
Harsan	0-18	-65-	-27-	5- 8- 10	1.30-1.40-1.50	14.11-28.23-42.34	0.13-0.14-0.15	0.0- 1.5- 2.9	0.5- 0.8- 1.0	.32	.32	3	3	86
	18-35	-56-	-18-	22-26- 30	1.30-1.40-1.50	1.41-2.82-4.23	0.14-0.15-0.16	3.0- 4.5- 5.9	0.0- 0.3- 0.5	.24	.24			
	35-51	-45-	-32-	20-23- 26	1.30-1.40-1.50	4.00-9.00-14.11	0.18-0.20-0.21	3.0- 4.5- 5.9	0.0- 0.3- 0.5	.43	.43			

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
	51-60	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
183—Starbuck-Sidlake-Rock outcrop complex, 2 to 15 percent slopes														
Starbuck	0-3	-67-	-20-	10-13- 16	1.35-1.45-1.55	14.11-28.23-42.34	0.10-0.13-0.16	0.0- 1.5- 2.9	0.7- 0.9-1.0	.28	.28	1	3	86
	3-16	-40-	-44-	14-16- 18	1.30-1.40-1.50	4.00-9.00-14.11	0.13-0.16-0.18	0.0- 1.5- 2.9	0.0- 0.3-0.5	.49	.49			
	16-26	—	—	—	—	—	—	—	—					
Sidlake	0-3	-63-	-26-	8-12- 15	1.45-1.50-1.55	14.11-28.23-42.34	0.13-0.14-0.15	0.0- 1.5- 2.9	0.7- 0.9-1.0	.28	.28	2	3	86
	3-8	-45-	-41-	8-14- 20	1.45-1.53-1.60	14.11-28.23-42.34	0.14-0.16-0.17	0.0- 1.5- 2.9	0.5- 0.8-1.0	.43	.43			
	8-18	-52-	-27-	18-21- 24	1.45-1.53-1.60	1.41-7.76-14.11	0.15-0.17-0.18	0.0- 1.5- 2.9	0.5- 0.8-1.0	.37	.37			
	18-24	-36-	-38-	20-26- 32	1.50-1.58-1.65	1.41-7.76-14.11	0.15-0.17-0.19	3.0- 4.5- 5.9	0.0- 0.3-0.5	.43	.43			
	24-34	—	—	—	—	—	—	—	—					
Rock outcrop	0-60	—	—	—	—	—	—	—	—					

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
212—Wendell-Ackelton complex, 1 to 4 percent slopes														
Wendell	0-8	-63-	-26-	8-12- 15	1.30-1.40-1.50	14.11-28.23-42.34	0.10-0.12-0.14	0.0- 1.5- 2.9	0.7- 0.9- 1.0	.28	.28	2	3	86
	8-19	-45-	-35-	15-21- 26	1.30-1.40-1.50	4.00-9.00-14.11	0.05-0.10-0.14	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.37	.37			
	19-32	-49-	-29-	18-22- 26	1.30-1.40-1.50	4.00-9.00-14.11	0.12-0.14-0.16	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.37	.37			
	32-39	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	39-49	—	—	—	—	—	—	—	—					
Ackelton	0-11	-63-	-26-	8-11- 14	1.30-1.40-1.50	14.11-28.23-42.34	0.10-0.12-0.13	0.0- 1.5- 2.9	0.7- 0.9- 1.0	.24	.24	3	3	86
	11-39	-59-	-18-	18-23- 27	1.25-1.35-1.45	4.00-9.00-14.11	0.14-0.15-0.16	3.0- 4.5- 5.9	0.0- 0.3- 0.5	.24	.24			
	39-53	-43-	-40-	15-18- 20	1.30-1.40-1.50	4.00-9.00-14.11	0.13-0.14-0.15	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.49	.49			
	53-62	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	62-76	-86-	- 7-	4- 7- 10	1.50-1.60-1.70	42.00-91.74-141.14	0.05-0.07-0.09	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.49	.49			

Water Features

This folder contains tabular reports that present soil hydrology information. The reports (tables) include all selected map units and components for each map unit. Water Features include ponding frequency, flooding frequency, and depth to water table.

Water Features (Low Farm)

This table gives estimates of various soil water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

Surface runoff refers to the loss of water from an area by flow over the land surface. Surface runoff classes are based on slope, climate, and vegetative cover. The concept indicates relative runoff for very specific conditions. It is assumed that the surface of the soil is bare and that the retention of surface water resulting from irregularities in the ground surface is minimal. The classes are negligible, very low, low, medium, high, and very high.

The *months* in the table indicate the portion of the year in which a water table, ponding, and/or flooding is most likely to be a concern.

Water table refers to a saturated zone in the soil. The water features table indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on

observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table. The kind of water table, apparent or perched, is given if a seasonal high water table exists in the soil. A water table is perched if free water is restricted from moving downward in the soil by a restrictive feature, in most cases a hardpan; there is a dry layer of soil underneath a wet layer. A water table is apparent if free water is present in all horizons from its upper boundary to below 2 meters or to the depth of observation. The water table kind listed is for the first major component in the map unit.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. The table indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Duration and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and *very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Custom Soil Resource Report

Map unit symbol and soil name	Hydrologic group	Surface runoff	Most likely months	Water table			Ponding			Flooding	
				Upper limit	Lower limit	Kind	Surface depth	Duration	Frequency	Duration	Frequency
				<i>Ft</i>	<i>Ft</i>		<i>Ft</i>				
24—Burch-Quencheroo-Dryck complex, 0 to 2 percent slopes											
Burch	B		Jan-Dec	—	—	—	—	—	None	—	None
Quencheroo	C		Jan-Dec	—	—	—	—	—	None	—	None
Dryck	A		Jan-Dec	—	—	—	—	—	None	—	None
151—Quencheroo-Loupence complex, 0 to 1 percent slopes											
Quencheroo	C		Jan-Dec	—	—	—	—	—	None	—	None
Loupence	C		Jan-Dec	—	—	—	—	—	None	—	None
171—Snowmore-Besslen-Hoosegow complex, 1 to 4 percent slopes											
Snowmore	C		Jan-Dec	—	—	—	—	—	None	—	None
Besslen	D		Jan-Dec	—	—	—	—	—	None	—	None
Hoosegow	B		Jan-Dec	—	—	—	—	—	None	—	None
177—Snowmore-Wako-Harsan complex, 1 to 4 percent slopes											
Snowmore	C		Jan-Dec	—	—	—	—	—	None	—	None
Wako	C		Jan-Dec	—	—	—	—	—	None	—	None
Harsan	C		Jan-Dec	—	—	—	—	—	None	—	None
183—Starbuck-Sidlake-Rock outcrop complex, 2 to 15 percent slopes											
Starbuck	D		Jan-Dec	—	—	—	—	—	None	—	None
Sidlake	C		Jan-Dec	—	—	—	—	—	None	—	None
Rock outcrop			Jan-Dec	—	—	—	—	—	None	—	None
212—Wendell-Ackelton complex, 1 to 4 percent slopes											
Wendell	C		Jan-Dec	—	—	—	—	—	None	—	None
Ackelton	B		Jan-Dec	—	—	—	—	—	None	—	None

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United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

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Cooperative Soil Survey,
a joint effort of the United
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Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties

Four Brothers German Farm



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

Preface	2
How Soil Surveys Are Made	5
Soil Map	8
Soil Map (German Farm).....	9
Legend.....	10
Map Unit Legend (German Farm).....	12
Map Unit Descriptions (German Farm).....	12
Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties.....	14
27—Catchell-Gooding complex, 2 to 6 percent slopes.....	14
70—Gooding-Catchell complex, 1 to 3 percent slopes.....	15
74—Gooding-Power complex, 0 to 2 percent slopes.....	17
Soil Information for All Uses	19
Soil Reports.....	19
Soil Physical Properties.....	19
Physical Soil Properties (German Farm).....	19
Water Features.....	25
Water Features (German Farm).....	25
References	28

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

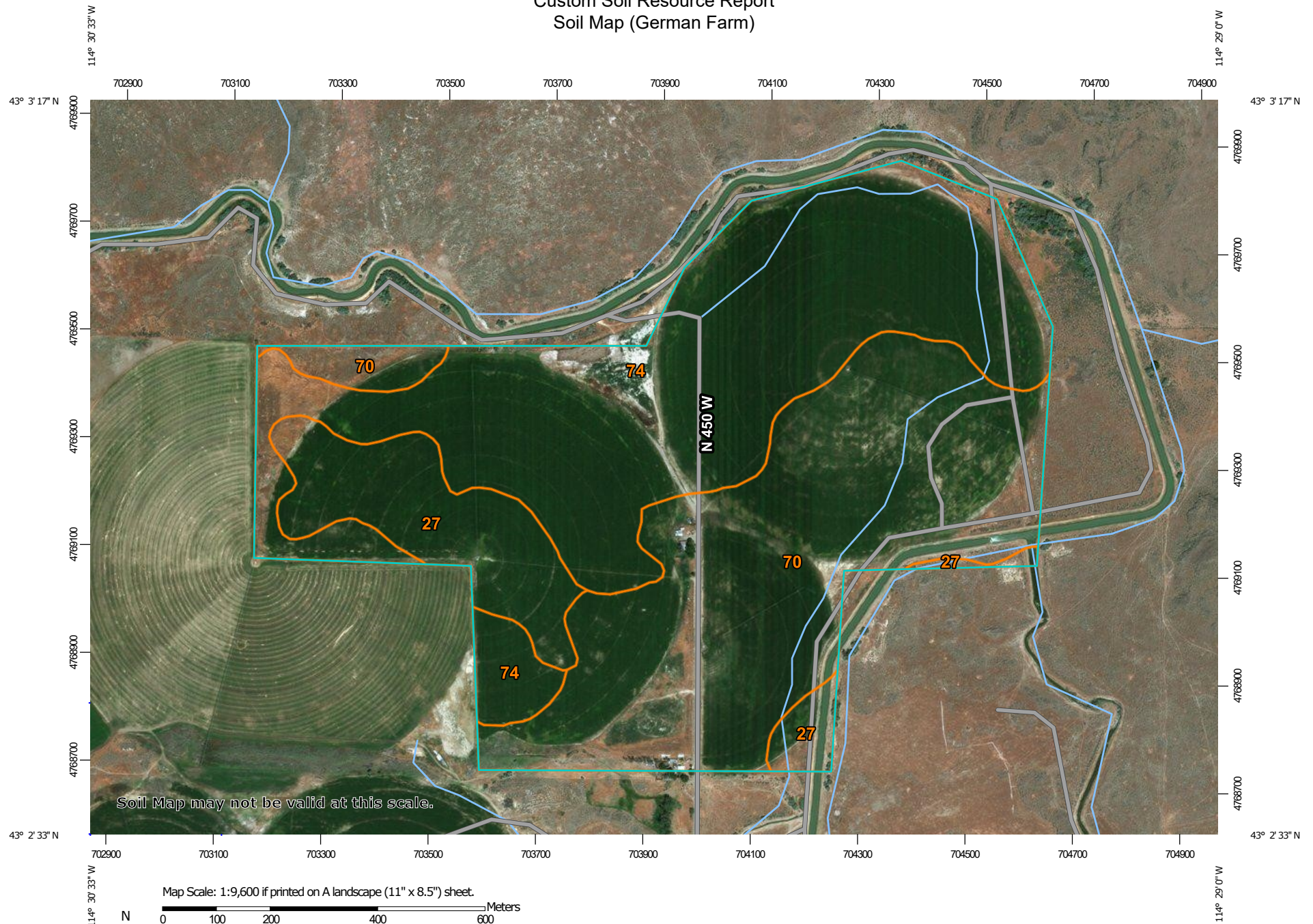
Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map (German Farm)




MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit

 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water

 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot

 Sinkhole

 Slide or Slip

 Sodic Spot

 Spoil Area

 Stony Spot

 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

Water Features

 Streams and Canals

Transportation

 Rails


 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties
Survey Area Data: Version 17, Jun 4, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 14, 2012—Nov 8, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (German Farm)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
27	Catchell-Gooding complex, 2 to 6 percent slopes	32.0	12.4%
70	Gooding-Catchell complex, 1 to 3 percent slopes	105.1	40.6%
74	Gooding-Power complex, 0 to 2 percent slopes	121.5	47.0%
Totals for Area of Interest		258.7	100.0%

Map Unit Descriptions (German Farm)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties

27—Catchell-Gooding complex, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2r8w
Elevation: 3,500 to 5,300 feet
Mean annual precipitation: 8 to 13 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 90 to 125 days
Farmland classification: Not prime farmland

Map Unit Composition

Catchell and similar soils: 50 percent
Gooding and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Catchell

Setting

Landform: Lava fields
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess and volcanic ash and/or alluvium over bedrock derived from rhyolite and/or welded tuff

Typical profile

E - 0 to 6 inches: very stony silt loam
Btk - 6 to 21 inches: clay
Bk - 21 to 26 inches: silty clay loam
Bkqm - 26 to 30 inches: cemented material
R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 38 inches to duripan; 25 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 40 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R011XB003ID - STONY LOAM 8-12 ARTRW8/PSSPS
Hydric soil rating: No

Description of Gooding

Setting

Landform: Lava fields

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Volcanic ash and/or mixed alluvium and/or loess over bedrock derived from rhyolite and/or basalt and/or welded tuff

Typical profile

Ap - 0 to 10 inches: silt loam

Btb - 10 to 45 inches: silty clay loam

Bkb - 45 to 54 inches: loam

Bkqb - 54 to 59 inches: cemented loam

R - 59 to 69 inches: bedrock

Properties and qualities

Slope: 2 to 6 percent

Depth to restrictive feature: 40 to 60 inches to duripan; 41 to 60 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 40 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Sodium adsorption ratio, maximum: 8.0

Available water capacity: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: D

Ecological site: R011XA005ID - CLAYPAN 8-12 ARTRW8/PSSPS

Hydric soil rating: No

70—Gooding-Catchell complex, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2rg4

Elevation: 3,500 to 5,300 feet

Mean annual precipitation: 8 to 13 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 90 to 125 days

Farmland classification: Not prime farmland

Map Unit Composition

Gooding and similar soils: 55 percent

Catchell and similar soils: 30 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gooding

Setting

Landform: Lava fields

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Volcanic ash and/or mixed alluvium and/or loess over bedrock derived from rhyolite and/or basalt and/or welded tuff

Typical profile

Ap - 0 to 10 inches: silt loam

Btb - 10 to 45 inches: silty clay loam

Bkb - 45 to 54 inches: loam

Bkqb - 54 to 59 inches: cemented loam

R - 59 to 69 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent

Depth to restrictive feature: 40 to 60 inches to duripan; 41 to 60 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 40 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Sodium adsorption ratio, maximum: 8.0

Available water capacity: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): 4s

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: D

Hydric soil rating: No

Description of Catchell

Setting

Landform: Lava fields

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess and volcanic ash and/or alluvium over bedrock derived from rhyolite and/or welded tuff

Typical profile

E - 0 to 6 inches: very stony silt loam

Btk - 6 to 21 inches: clay

Bk - 21 to 26 inches: silty clay loam

Bkqm - 26 to 30 inches: cemented material

R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent

Depth to restrictive feature: 20 to 38 inches to duripan; 25 to 40 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 40 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water capacity: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): 6s

Land capability classification (nonirrigated): 6s

Hydrologic Soil Group: D

Hydric soil rating: No

74—Gooding-Power complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2rg8

Elevation: 2,000 to 5,300 feet

Mean annual precipitation: 8 to 13 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 90 to 170 days

Farmland classification: Farmland of statewide importance, if irrigated

Map Unit Composition

Gooding and similar soils: 55 percent

Power and similar soils: 30 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gooding

Setting

Landform: Lava fields

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Volcanic ash and/or mixed alluvium and/or loess over bedrock derived from rhyolite and/or basalt and/or welded tuff

Typical profile

Ap - 0 to 10 inches: silt loam

Btb - 10 to 45 inches: silty clay loam

Bkb - 45 to 54 inches: loam

Bkqb - 54 to 59 inches: cemented loam

R - 59 to 69 inches: bedrock

Properties and qualities

Slope: 0 to 2 percent

Custom Soil Resource Report

Depth to restrictive feature: 40 to 60 inches to duripan; 41 to 60 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 40 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 8.0
Available water capacity: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Power

Setting

Landform: Lava fields
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium and/or loess

Typical profile

A - 0 to 6 inches: silt loam
Bt - 6 to 40 inches: silt loam
Bk - 40 to 64 inches: very fine sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water capacity: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Hydric soil rating: No

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Physical Soil Properties (German Farm)

This table shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is

given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity (Ksat), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates in the table are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity (Ksat) is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause

damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil.

Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (K_w and K_f) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and K_{sat} . Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor K_w indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor K_f indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook."

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Reference:

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. (<http://soils.usda.gov>)

Custom Soil Resource Report

Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/in</i>	<i>Pct</i>	<i>Pct</i>					
27—Catchell-Gooding complex, 2 to 6 percent slopes														
Catchell	0-6	-26-	-52-	18-22- 25	1.40-1.45-1.50	4.00-9.00-14.11	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.17	.49	2	8	0
	6-21	-28-	-29-	35-43- 50	1.40-1.45-1.50	0.00-0.21-0.42	0.14-0.15-0.16	6.0- 7.5- 8.9	0.5- 1.3- 2.0	.28	.28			
	21-26	-12-	-58-	10-30- 30	1.50-1.55-1.60	4.00-9.00-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.49	.49			
	26-30	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	30-40	—	—	—	—	—	—	—	—					
Gooding	0-10	-25-	-53-	20-23- 25	1.20-1.30-1.40	1.41-2.82-4.23	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.43	.43	3	6	48
	10-45	- 6-	-57-	35-37- 59	1.35-1.45-1.55	0.00-0.21-0.42	0.14-0.18-0.21	6.0- 7.5- 8.9	0.7- 0.9- 1.0	.43	.43			
	45-54	-30-	-45-	25-26- 40	1.25-1.38-1.50	0.42-0.92-1.41	0.14-0.18-0.21	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	54-59	-30-	-45-	25-26- 40	1.25-1.38-1.50	0.01-0.22-0.42	0.00-0.00-0.00	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	59-69	—	—	—	—	—	—	—	—					

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
70—Gooding-Catchell complex, 1 to 3 percent slopes														
Gooding	0-10	-25-	-53-	20-23- 25	1.20-1.30-1.40	1.41-2.82-4.23	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.43	.43	3	6	48
	10-45	- 6-	-57-	35-37- 59	1.35-1.45-1.55	0.00-0.21-0.42	0.14-0.18-0.21	6.0- 7.5- 8.9	0.7- 0.9- 1.0	.43	.43			
	45-54	-40-	-35-	15-26- 40	1.25-1.38-1.50	0.42-0.92-1.41	0.14-0.18-0.21	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	54-59	-40-	-35-	25-26- 40	1.25-1.38-1.50	0.01-0.22-0.42	0.00-0.00-0.00	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	59-69	—	—	—	—	—	—	—	—					
Catchell	0-6	-26-	-52-	18-22- 25	1.40-1.45-1.50	4.00-9.00-14.11	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.17	.49	2	8	0
	6-21	-28-	-29-	35-43- 50	1.40-1.45-1.50	0.00-0.21-0.42	0.14-0.15-0.16	6.0- 7.5- 8.9	0.5- 1.3- 2.0	.28	.28			
	21-26	-12-	-58-	18-30- 40	1.50-1.55-1.60	4.00-9.00-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.49	.49			
	26-30	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	30-40	—	—	—	—	—	—	—	—					

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
74—Gooding-Power complex, 0 to 2 percent slopes														
Gooding	0-10	-25-	-53-	20-23- 25	1.20-1.30-1.40	1.41-2.82-4.23	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 2.0- 3.0	.43	.43	3	6	48
	10-45	- 6-	-57-	35-37- 59	1.35-1.45-1.55	0.00-0.21-0.42	0.14-0.18-0.21	6.0- 7.5- 8.9	0.7- 0.9- 1.0	.43	.43			
	45-54	-40-	-35-	25-26- 40	1.25-1.38-1.50	0.42-0.92-1.41	0.14-0.18-0.21	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	54-59	-40-	-35-	25-26- 40	1.25-1.38-1.50	0.01-0.22-0.42	0.00-0.00-0.00	6.0- 7.5- 8.9	0.0- 0.3- 0.5	.43	.43			
	59-69	—	—	—	—	—	—	—	—					
Power	0-6	-11-	-69-	18-20- 22	1.30-1.40-1.50	4.00-9.00-14.11	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.43	.43	5	6	48
	6-40	- 7-	-74-	14-20- 35	1.20-1.35-1.50	1.41-2.82-4.23	0.16-0.19-0.21	3.0- 4.5- 5.9	0.5- 0.8- 1.0	.55	.55			
	40-64	-61-	-22-	15-18- 20	1.35-1.45-1.55	4.00-9.00-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.55	.55			

Water Features

This folder contains tabular reports that present soil hydrology information. The reports (tables) include all selected map units and components for each map unit. Water Features include ponding frequency, flooding frequency, and depth to water table.

Water Features (German Farm)

This table gives estimates of various soil water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

Surface runoff refers to the loss of water from an area by flow over the land surface. Surface runoff classes are based on slope, climate, and vegetative cover. The concept indicates relative runoff for very specific conditions. It is assumed that the surface of the soil is bare and that the retention of surface water resulting from irregularities in the ground surface is minimal. The classes are negligible, very low, low, medium, high, and very high.

The *months* in the table indicate the portion of the year in which a water table, ponding, and/or flooding is most likely to be a concern.

Water table refers to a saturated zone in the soil. The water features table indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on

observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table. The kind of water table, apparent or perched, is given if a seasonal high water table exists in the soil. A water table is perched if free water is restricted from moving downward in the soil by a restrictive feature, in most cases a hardpan; there is a dry layer of soil underneath a wet layer. A water table is apparent if free water is present in all horizons from its upper boundary to below 2 meters or to the depth of observation. The water table kind listed is for the first major component in the map unit.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. The table indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Duration and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and *very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Custom Soil Resource Report

Map unit symbol and soil name	Hydrologic group	Surface runoff	Most likely months	Water table			Ponding			Flooding	
				Upper limit	Lower limit	Kind	Surface depth	Duration	Frequency	Duration	Frequency
				<i>Ft</i>	<i>Ft</i>		<i>Ft</i>				
27—Catchell-Gooding complex, 2 to 6 percent slopes											
Catchell	D		Jan-Dec	—	—	—	—	—	None	—	None
Gooding	D		Jan-Dec	—	—	—	—	—	None	—	None
70—Gooding-Catchell complex, 1 to 3 percent slopes											
Gooding	D		Jan-Dec	—	—	—	—	—	None	—	None
Catchell	D		Jan-Dec	—	—	—	—	—	None	—	None
74—Gooding-Power complex, 0 to 2 percent slopes											
Gooding	D		Jan-Dec	—	—	—	—	—	None	—	None
Power	C		Jan-Dec	—	—	—	—	—	None	—	None

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NRCS

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Conservation
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agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties

Four Brothers Dietrich Farm



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

Preface	2
How Soil Surveys Are Made	5
Soil Map	8
Soil Map (Dietrich Farm).....	9
Legend.....	10
Map Unit Legend (Dietrich Farm).....	12
Map Unit Descriptions (Dietrich Farm).....	12
Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties.....	14
82—Hoosegow-McPan-Rock outcrop complex, 2 to 10 percent slopes.....	14
122—McPan-Power complex, 1 to 3 percent slopes.....	16
139—Paulville loam, 0 to 2 percent slopes.....	17
148—Power-McPan complex, 1 to 3 percent slopes.....	18
182—Starbuck-Rock outcrop-McPan complex, 2 to 6 percent slopes.....	20
Soil Information for All Uses	23
Soil Reports.....	23
Soil Physical Properties.....	23
Physical Soil Properties (Dietrich Farm).....	23
Water Features.....	31
Water Features (Dietrich Farm).....	31
References	34

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map (Dietrich Farm)




MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit

 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water

 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot

 Sinkhole

 Slide or Slip

 Sodic Spot

 Spoil Area

 Stony Spot

 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

Water Features

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties
Survey Area Data: Version 17, Jun 4, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 14, 2012—Nov 8, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (Dietrich Farm)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
82	Hoosegow-McPan-Rock outcrop complex, 2 to 10 percent slopes	112.0	34.6%
122	McPan-Power complex, 1 to 3 percent slopes	26.8	8.3%
139	Paulville loam, 0 to 2 percent slopes	105.9	32.7%
148	Power-McPan complex, 1 to 3 percent slopes	71.4	22.1%
182	Starbuck-Rock outcrop-McPan complex, 2 to 6 percent slopes	7.3	2.3%
Totals for Area of Interest		323.4	100.0%

Map Unit Descriptions (Dietrich Farm)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it

was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties

82—Hoosegow-McPan-Rock outcrop complex, 2 to 10 percent slopes

Map Unit Setting

National map unit symbol: 2rgk

Elevation: 3,200 to 4,700 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 46 to 52 degrees F

Frost-free period: 90 to 140 days

Farmland classification: Not prime farmland

Map Unit Composition

Hoosegow and similar soils: 35 percent

Mcpan and similar soils: 30 percent

Rock outcrop: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hoosegow

Setting

Landform: Drainageways, hills

Landform position (two-dimensional): Toeslope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium

Typical profile

A1 - 0 to 2 inches: loam

A2 - 2 to 12 inches: loam

Bt - 12 to 37 inches: sandy clay loam

BC - 37 to 56 inches: fine sandy loam

C - 56 to 68 inches: loamy fine sand

Properties and qualities

Slope: 2 to 6 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.57 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 3 percent

Available water capacity: High (about 9.3 inches)

Interpretive groups

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: B

Ecological site: R011XY015ID - LOAMY BOTTOM 8-14 ARTRT/LECI4

Hydric soil rating: No

Description of Mcpan

Setting

Landform: Hills

Landform position (two-dimensional): Summit, backslope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Silty alluvium and/or loess over bedrock derived from volcanic rock

Typical profile

Ap - 0 to 5 inches: silt loam

Btk - 5 to 23 inches: silt loam

Bkq - 23 to 28 inches: silt loam

Bkqm - 28 to 29 inches: cemented material

R - 29 to 39 inches: bedrock

Properties and qualities

Slope: 2 to 10 percent

Depth to restrictive feature: 20 to 39 inches to duripan; 21 to 40 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water capacity: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: C

Ecological site: R011XY001ID - LOAMY 8-12 - Provisional

Hydric soil rating: No

Description of Rock Outcrop

Typical profile

R - 0 to 60 inches: bedrock

Properties and qualities

Slope: 2 to 10 percent

Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8

Hydric soil rating: Unranked

122—McPan-Power complex, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2r5c
Elevation: 2,000 to 4,700 feet
Mean annual precipitation: 8 to 12 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 100 to 170 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Mcpan and similar soils: 55 percent
Power and similar soils: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mcpan

Setting

Landform: Lava fields
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty alluvium and/or loess over bedrock derived from volcanic rock

Typical profile

Ap - 0 to 5 inches: silt loam
Btk - 5 to 23 inches: silt loam
Bkq - 23 to 28 inches: silt loam
Bkqm - 28 to 29 inches: cemented material
R - 29 to 39 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: 20 to 39 inches to duripan; 21 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C

Hydric soil rating: No

Description of Power

Setting

Landform: Lava fields

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium and/or loess

Typical profile

A - 0 to 6 inches: silt loam

Bt - 6 to 38 inches: silt loam

Bk - 38 to 64 inches: silt loam

Properties and qualities

Slope: 1 to 3 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Sodium adsorption ratio, maximum: 5.0

Available water capacity: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: C

Hydric soil rating: No

139—Paulville loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2r5y

Elevation: 2,800 to 4,700 feet

Mean annual precipitation: 8 to 11 inches

Mean annual air temperature: 46 to 52 degrees F

Frost-free period: 95 to 120 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Paulville and similar soils: 90 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Paulville

Setting

Landform: Drainageways, depressions

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium and/or loess and/or lacustrine deposits

Typical profile

A - 0 to 6 inches: loam

Bt - 6 to 30 inches: clay loam

Bk - 30 to 47 inches: silt loam

2C - 47 to 64 inches: loamy fine sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Maximum salinity: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)

Sodium adsorption ratio, maximum: 5.0

Available water capacity: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): 2s

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: C

Hydric soil rating: No

148—Power-McPan complex, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2r68

Elevation: 2,000 to 4,700 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 100 to 170 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Power and similar soils: 65 percent

Mcpan and similar soils: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Power

Setting

Landform: Hills, buttes
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium and/or loess

Typical profile

A - 0 to 6 inches: silt loam
Bt - 6 to 38 inches: silt loam
Bk - 38 to 64 inches: silt loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water capacity: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Mcpan

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty alluvium and/or loess over bedrock derived from volcanic rock

Typical profile

Ap - 0 to 5 inches: silt loam
Btk - 5 to 23 inches: silt loam
Bkq - 23 to 28 inches: silt loam
Bkqm - 28 to 29 inches: cemented material
R - 29 to 39 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: 20 to 39 inches to duripan; 21 to 40 inches to lithic bedrock
Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water capacity: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: C

Hydric soil rating: No

182—Starbuck-Rock outcrop-McPan complex, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2r7h

Elevation: 2,900 to 4,700 feet

Mean annual precipitation: 8 to 11 inches

Mean annual air temperature: 46 to 54 degrees F

Frost-free period: 95 to 140 days

Farmland classification: Not prime farmland

Map Unit Composition

Starbuck and similar soils: 45 percent

Rock outcrop: 25 percent

Mcpan and similar soils: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Starbuck

Setting

Landform: Ridges

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium and/or eolian deposits over bedrock derived from basalt

Typical profile

A - 0 to 6 inches: silt loam

Bw - 6 to 16 inches: silt loam

R - 16 to 26 inches: bedrock

Properties and qualities

Slope: 2 to 6 percent

Depth to restrictive feature: 12 to 20 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)

Custom Soil Resource Report

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.6 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R011XA003ID - SHALLOW LOAMY 8-12 ARTTRT/PSSPS
Hydric soil rating: No

Description of Rock Outcrop

Typical profile

R - 0 to 60 inches: bedrock

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Unranked

Description of Mcpan

Setting

Landform: Lava fields
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty alluvium and/or loess over bedrock derived from volcanic rock

Typical profile

Ap - 0 to 5 inches: silt loam
Btk - 5 to 23 inches: silt loam
Bkq - 23 to 28 inches: silt loam
Bkqm - 28 to 29 inches: cemented material
R - 29 to 39 inches: bedrock

Properties and qualities

Slope: 2 to 4 percent
Depth to restrictive feature: 20 to 39 inches to duripan; 21 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Custom Soil Resource Report

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: C

Ecological site: R011XY001ID - LOAMY 8-12 - Provisional

Hydric soil rating: No

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Physical Soil Properties (Dietrich Farm)

This table shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is

given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity (*K_{sat}*), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

*Saturated hydraulic conductivity (*K_{sat}*)* refers to the ease with which pores in a saturated soil transmit water. The estimates in the table are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity (*K_{sat}*) is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause

damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil.

Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (K_w and K_f) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and K_{sat} . Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor K_w indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor K_f indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook."

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Reference:

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. (<http://soils.usda.gov>)

Custom Soil Resource Report

Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/in</i>	<i>Pct</i>	<i>Pct</i>					
82—Hoosegow-McPan-Rock outcrop complex, 2 to 10 percent slopes														
Hoosegow	0-2	-46-	-42-	10-13- 15	1.45-1.50-1.55	4.00-9.00-14.11	0.13-0.16-0.19	0.0- 1.5- 2.9	0.8- 0.9- 1.0	.43	.43	4	5	56
	2-12	-44-	-40-	14-16- 18	1.50-1.58-1.65	4.00-9.00-14.11	0.10-0.15-0.19	0.0- 1.5- 2.9	0.5- 0.8- 1.0	.43	.43			
	12-37	-59-	-17-	20-24- 27	1.55-1.60-1.65	4.00-9.00-14.11	0.13-0.17-0.20	3.0- 4.5- 5.9	0.5- 0.8- 1.0	.24	.24			
	37-56	-56-	-32-	10-13- 15	1.50-1.55-1.60	14.11-28.23-42.34	0.10-0.15-0.19	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.37	.37			
	56-68	-82-	-10-	5- 8- 10	1.55-1.60-1.65	42.00-91.74-141.14	0.08-0.11-0.14	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.15	.15			
Mcpan	0-5	-11-	-67-	18-22- 25	1.20-1.35-1.50	4.00-9.00-14.11	0.14-0.17-0.20	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.43	.43	2	6	48
	5-23	- 9-	-65-	24-26- 32	1.20-1.35-1.50	1.41-2.82-4.23	0.14-0.17-0.20	3.0- 4.5- 5.9	0.5- 0.8- 1.0	.49	.49			
	23-28	-23-	-54-	20-23- 26	1.25-1.43-1.60	4.00-9.00-14.11	0.13-0.17-0.20	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.55	.55			
	28-29	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	29-39	—	—	—	—	—	—	—	—					
Rock outcrop	0-60	—	—	—	—	—	—	—	—					

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
122—McPan-Power complex, 1 to 3 percent slopes														
Mcpan	0-5	-11-	-67-	18-22- 25	1.20-1.35-1.50	4.00-9.00-14.11	0.14-0.17-0.20	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.43	.43	2	6	48
	5-23	- 9-	-65-	24-26- 32	1.20-1.35-1.50	1.41-2.82-4.23	0.14-0.17-0.20	3.0- 4.5- 5.9	0.5- 0.8- 1.0	.49	.49			
	23-28	-23-	-54-	20-23- 26	1.25-1.43-1.60	4.00-9.00-14.11	0.13-0.17-0.20	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.55	.55			
	28-29	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	29-39	—	—	—	—	—	—	—	—					
Power	0-6	-11-	-69-	18-20- 22	1.30-1.40-1.50	4.00-9.00-14.11	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.43	.43	5	6	48
	6-38	- 7-	-67-	24-27- 35	1.20-1.35-1.50	1.41-2.82-4.23	0.16-0.19-0.21	3.0- 4.5- 5.9	0.5- 0.8- 1.0	.49	.49			
	38-64	-21-	-62-	15-18- 20	1.35-1.45-1.55	4.00-9.00-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.55	.55			

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/in</i>	<i>Pct</i>	<i>Pct</i>					
139—Paulville loam, 0 to 2 percent slopes														
Paulville	0-6	-42-	-38-	16-20- 24	1.25-1.30-1.35	4.00-9.00-14.11	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.32	.32	5	6	48
	6-30	-20-	-45-	18-35- 40	1.30-1.35-1.40	1.41-2.82-4.23	0.19-0.20-0.21	3.0- 4.5- 5.9	0.0- 0.3- 0.5	.37	.37			
	30-47	-33-	-54-	10-13- 15	1.30-1.38-1.45	4.00-9.00-14.11	0.15-0.16-0.17	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.55	.55			
	47-64	-83-	-10-	5- 8- 10	1.50-1.58-1.65	14.11-28.23-42.34	0.11-0.12-0.13	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.17	.17			

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/in</i>	<i>Pct</i>	<i>Pct</i>					
148—Power-McPan complex, 1 to 3 percent slopes														
Power	0-6	-11-	-69-	18-20- 22	1.30-1.40-1.50	4.00-9.00-14.11	0.19-0.20-0.21	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.43	.43	5	6	48
	6-38	- 7-	-67-	24-27- 35	1.20-1.35-1.50	1.41-2.82-4.23	0.16-0.19-0.21	3.0- 4.5- 5.9	0.5- 0.8- 1.0	.49	.49			
	38-64	-31-	-52-	15-18- 20	1.35-1.45-1.55	4.00-9.00-14.11	0.16-0.17-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.55	.55			
Mcpan	0-5	-11-	-67-	18-22- 25	1.20-1.35-1.50	4.00-9.00-14.11	0.14-0.17-0.20	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.43	.43	2	6	48
	5-23	- 9-	-65-	24-26- 32	1.20-1.35-1.50	1.41-2.82-4.23	0.14-0.17-0.20	3.0- 4.5- 5.9	0.5- 0.8- 1.0	.49	.49			
	23-28	-23-	-54-	20-23- 26	1.25-1.43-1.60	4.00-9.00-14.11	0.13-0.17-0.20	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.55	.55			
	28-29	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	29-39	—	—	—	—	—	—	—	—					

Custom Soil Resource Report

Physical Soil Properties—Wood River Area, Idaho, Gooding County and Parts of Blaine, Lincoln, and Minidoka Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	<i>In</i>	<i>Pct</i>	<i>Pct</i>	<i>Pct</i>	<i>g/cc</i>	<i>micro m/sec</i>	<i>In/in</i>	<i>Pct</i>	<i>Pct</i>					
182—Starbuck-Rock outcrop-McPan complex, 2 to 6 percent slopes														
Starbuck	0-6	-29-	-53-	15-18- 20	1.30-1.38-1.45	4.00-9.00-14.11	0.14-0.16-0.18	0.0- 1.5- 2.9	0.7- 0.9- 1.0	.43	.43	1	5	56
	6-16	-30-	-54-	14-16- 18	1.30-1.40-1.50	4.00-9.00-14.11	0.13-0.16-0.18	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.55	.55			
	16-26	—	—	—	—	—	—	—	—					
Rock outcrop	0-60	—	—	—	—	—	—	—	—					
Mcpan	0-5	-11-	-67-	18-22- 25	1.20-1.35-1.50	4.00-9.00-14.11	0.14-0.17-0.20	0.0- 1.5- 2.9	1.0- 1.5- 2.0	.43	.43	2	6	48
	5-23	- 9-	-65-	24-26- 32	1.20-1.35-1.50	1.41-2.82-4.23	0.14-0.17-0.20	3.0- 4.5- 5.9	0.5- 0.8- 1.0	.49	.49			
	23-28	-23-	-54-	20-23- 26	1.25-1.43-1.60	4.00-9.00-14.11	0.13-0.17-0.20	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.55	.55			
	28-29	—	—	—	—	0.01-0.22-0.42	0.00-0.00-0.00	—	—					
	29-39	—	—	—	—	—	—	—	—					

Water Features

This folder contains tabular reports that present soil hydrology information. The reports (tables) include all selected map units and components for each map unit. Water Features include ponding frequency, flooding frequency, and depth to water table.

Water Features (Dietrich Farm)

This table gives estimates of various soil water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

Surface runoff refers to the loss of water from an area by flow over the land surface. Surface runoff classes are based on slope, climate, and vegetative cover. The concept indicates relative runoff for very specific conditions. It is assumed that the surface of the soil is bare and that the retention of surface water resulting from irregularities in the ground surface is minimal. The classes are negligible, very low, low, medium, high, and very high.

The *months* in the table indicate the portion of the year in which a water table, ponding, and/or flooding is most likely to be a concern.

Water table refers to a saturated zone in the soil. The water features table indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on

observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table. The kind of water table, apparent or perched, is given if a seasonal high water table exists in the soil. A water table is perched if free water is restricted from moving downward in the soil by a restrictive feature, in most cases a hardpan; there is a dry layer of soil underneath a wet layer. A water table is apparent if free water is present in all horizons from its upper boundary to below 2 meters or to the depth of observation. The water table kind listed is for the first major component in the map unit.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. The table indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Duration and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and *very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Custom Soil Resource Report

Map unit symbol and soil name	Hydrologic group	Surface runoff	Most likely months	Water table			Ponding			Flooding	
				Upper limit	Lower limit	Kind	Surface depth	Duration	Frequency	Duration	Frequency
				<i>Ft</i>	<i>Ft</i>		<i>Ft</i>				
82—Hoosegow-McPan-Rock outcrop complex, 2 to 10 percent slopes											
Hoosegow	B		Jan-Dec	—	—	—	—	—	None	—	None
Mcpan	C		Jan-Dec	—	—	—	—	—	None	—	None
Rock outcrop			Jan-Dec	—	—	—	—	—	None	—	None
122—McPan-Power complex, 1 to 3 percent slopes											
Mcpan	C		Jan-Dec	—	—	—	—	—	None	—	None
Power	C		Jan-Dec	—	—	—	—	—	None	—	None
139—Paulville loam, 0 to 2 percent slopes											
Paulville	C		Jan-Dec	—	—	—	—	—	None	—	None
148—Power-McPan complex, 1 to 3 percent slopes											
Power	C		Jan-Dec	—	—	—	—	—	None	—	None
Mcpan	C		Jan-Dec	—	—	—	—	—	None	—	None
182—Starbuck-Rock outcrop-McPan complex, 2 to 6 percent slopes											
Starbuck	D		Jan-Dec	—	—	—	—	—	None	—	None
Rock outcrop			Jan-Dec	—	—	—	—	—	None	—	None
Mcpan	C		Jan-Dec	—	—	—	—	—	None	—	None

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Appendix I – Pond Evaluations

Table A-2b - Container Storage Summary with Evaluation Date

Container Name	Volume (ft3)	Storage Period (Days)	Length	Width	Depth	Freeboard	Slope	Evaluation Date
B1 Separator Pond	35,991	180	225.0	72.0	4	1	3	
B1 Lagoon 1	173,115	180	330.0	166.0	4.5	1	2	
B1 Lagoon 2	1,252,387	180	423.4	300.0	15	2	2.7	10/26/2017
Calf Berm	144,937	180	600.0	250.0	2	1	2	
SW Pump Pit	8,661	180	77.0	67.0	4.5	2	2	
B2 Settling	51,588	180	200.0	100.0	4.33	1	3	11/16/2020
B2 Lagoon 1	544,920	180	420.0	200.0	8.5	1	2	
B2 Lagoon 2	242,222	180	290.0	175.0	6.5	1	2	
B2 East 1	706,324	180	391.8	370.0	6.5	1	3	10/26/2017
B2 East 2	594,475	180	396.3	286.0	7.1	1	3	10/26/2017
B2 East 3	213,624	180	310.5	224.0	4.5	1	3	10/26/2017
B2 East 4	77,243	180	332.9	165.0	2.5	1	2	
Commod Collect Berm	26,384	180	700.0	36.0	2.5	1	3	
B3 Pond 1	234,168	180	512.0	172.0	4			
B3 Pond 2	370,211	180	361.0	172.0	8	1	2	
B3 Pond 3	202,929	180	335.0	169.0	5	1	2	
B3 Pond 4	1,082,680	180	682.0	335.0	7.15	2	2	11/16/2020
B3 Old Flush	90,805	180	222.0	120.0	5	1	2	
B3 Compost Pond	451,985	180	449.1	280.0	5	1	3	12/10/2018
Pen 20 Pond	220,501	180	340.0	180.0	5	1	2	
B4 East Sep Cell	49,608	180	316.0	64.0	4	1	2	
B4 West Sep Cell	37,572	180	282.0	56.0	4	1	2	
B5 North Sep Cell	54,861	180	225.0	95.0	4	1	2	
B5 South Sep Cell	213,467	180	475.0	84.0	9	1	2.5	
B4 Pond 1	1,003,656	180	677.0	280.0	7	1	3	
B4 Pond 2	704,632	180	920.0	400.0	3	1	3	
B4 Pond 3	1,603,413	180	780.0	331.0	8	1	3	
B4 Pond 4	1,066,812	180	477.0	424.0	8	2	2	5/8/2015
Pen 40-1	378,523	180	353.4	300.0	5	1	3	10/26/2017
Pen 40-2	226,385	180	254.0	215.0	6	1	3	
Pen 40-3	369,700	180	416.0	208.0	6	1	3	
Pen 36	368,985	180	479.5	174.0	6.5	1	3.5	12/10/2018
B4 Compost Runoff Pond	1,359,818	180	723.2	500.0	5	1	3	10/26/2017
Pantone	453,364	180	400.1	260.0	6	1	3	10/26/2017
Buckway	838,661	180	393.1	270.0	11	1	3	12/10/2018
B4 Heifer Runoff Pond	252,225	180	251.0	240.0	6	1	3	
Andys Pond 1	62,620	180	174.0	67.2	13	1	2.3	11/27/2017
Andys Pond 2	564,529	180	318.0	180.0	14	1	2	

*B1,B2 etc are Barn 1, Barn 2 abbreviations etc.

B-3 #4

B-2 #1

November 16, 2020

Andrew Fitzgerald
Four Brothers Dairy
425 N 250 W
Shoshone, ID 83352

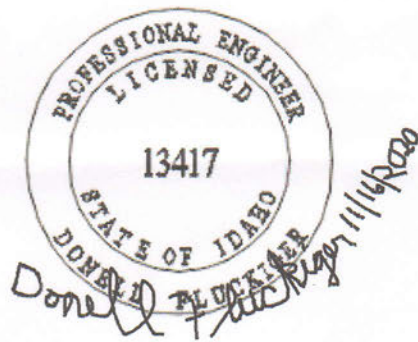
Subject: Pond Inspections

Mr. Fitzgerald,

At your request I have conducted a volume survey and evaluation of two existing wastewater containment structures at Four Brothers Dairy. During the evaluations soil samples were taken and the results are included with this report. Also, I have included location maps comments for the containment structures. The inspections do not constitute approval by the State of Idaho or Lincoln County, but may serve as verification for waste storage structure items found in the Idaho State Department of Agriculture (ISDA) Animal Waste Facility Construction Guidelines at the time of survey and inspection. It is advised to monitor and maintain proper maintenance of these structures including cleaning, liner thickness, riprap and water level in order to prevent erosion and leakage. For approval, you will need to contact the above-mentioned government agencies.

Sincerely,

Donell Fluckiger, P.E
Fluckiger Consulting
PO Box 463
Jerome, ID 83338
(208)421-0403



Containment Structures Commentary

Evaluation Overview

Evaluations of the containment structures were conducted using an Agronomics soil probe and a Bosch rotary hammer drill with a 1/2 inch bit steel bit of a 24 inch length. Measurements were taken using a Leica Robotic Total Station. Volumes were calculated using Carlson Civil software. The containment structures were checked for soil depth, compaction, bank slope, and volume. Soil samples were taken and sent to Natural Resource Solutions LLC for evaluation and indicate the percentage of clay ranges from 18-24%. This report is attached. For the report comments, depths were rounded to the nearest 0.5 foot. The width at the top of all banks exceeds 8 feet. Riprap has been installed in Barn 3 Lagoon 4. Portable will be used to pump wastewater into Barn 3 Lagoon 4. Riprap and Pipe were installed in Barn 2 Settling Pond 1. As always maintenance of the containment structures is the responsibility of the facility owner/operator.

Containment Volumes

The containment structures were surveyed to calculate the storage volumes. The tables shown on the attachments for each pond show the calculated storage volumes at full, 1 foot of freeboard, 2 feet of freeboard, bank slope, and top of bank width.

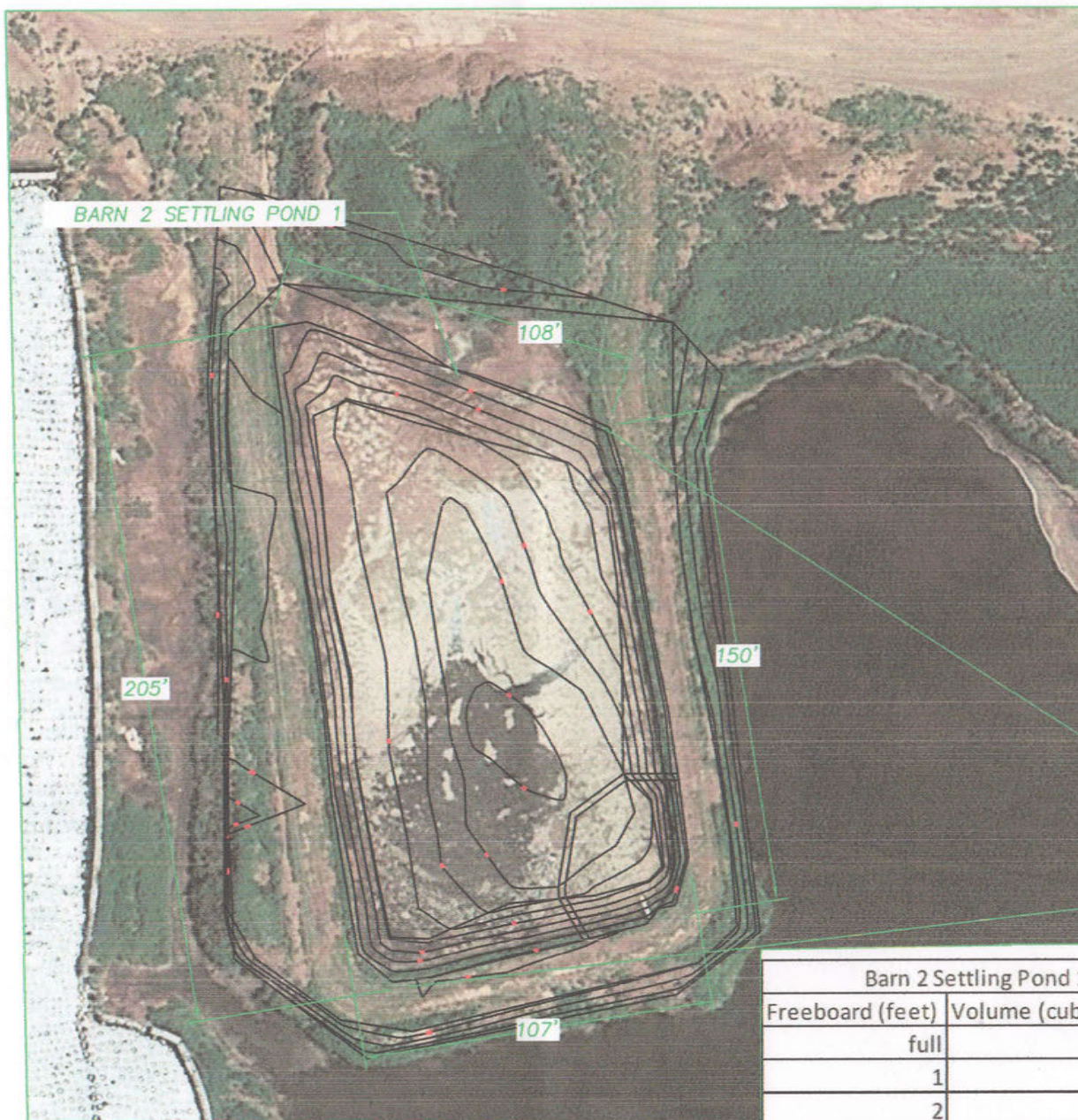
Barn 3 Lagoon 4

The Barn 3 Lagoon 4 is an existing pond located southeast of barn 3. It will be used for excess wastewater and was expanded to the north. The deepest pond depth is approximately 11 feet with an average depth of about 6.5 feet. The minimum top of bank is 9 feet. The average inside slope is approximately 3 horizontal: 1 vertical. The outside slope is approximately 3 horizontal: 1 vertical on the west bank. The bottom of the pond is two feet or more above bedrock. Riprap was installed. Portable pipe will be used to pump wastewater into this pond. Samples from the liner were taken on October 1, 2020. The clay content is 18%-22%.

Barn 2 Settling Pond 1

The Barn 2 Settling Pond 1 is an existing pond located south of Barn 2. It will be used for solids settling. The deepest pond depth is approximately 7 feet with an average depth of 4 feet. The minimum top of bank width is 12 feet. The average inside slope is approximately 2.5 horizontal: 1 vertical. The outside slope is approximately 2.5 horizontal: 1 vertical. The bottom of the pond is two feet or more above bedrock. Riprap and pipe were installed on the north end of the pond. Samples from the liner were taken on October 1, 2020. The clay content is 20%-24%.

FOUR BROTHERS DAIRY
425 N 250 W
SHOSHONE, ID



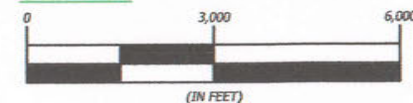
NORTHEAST VIEW



PIPE AND RIPRAP



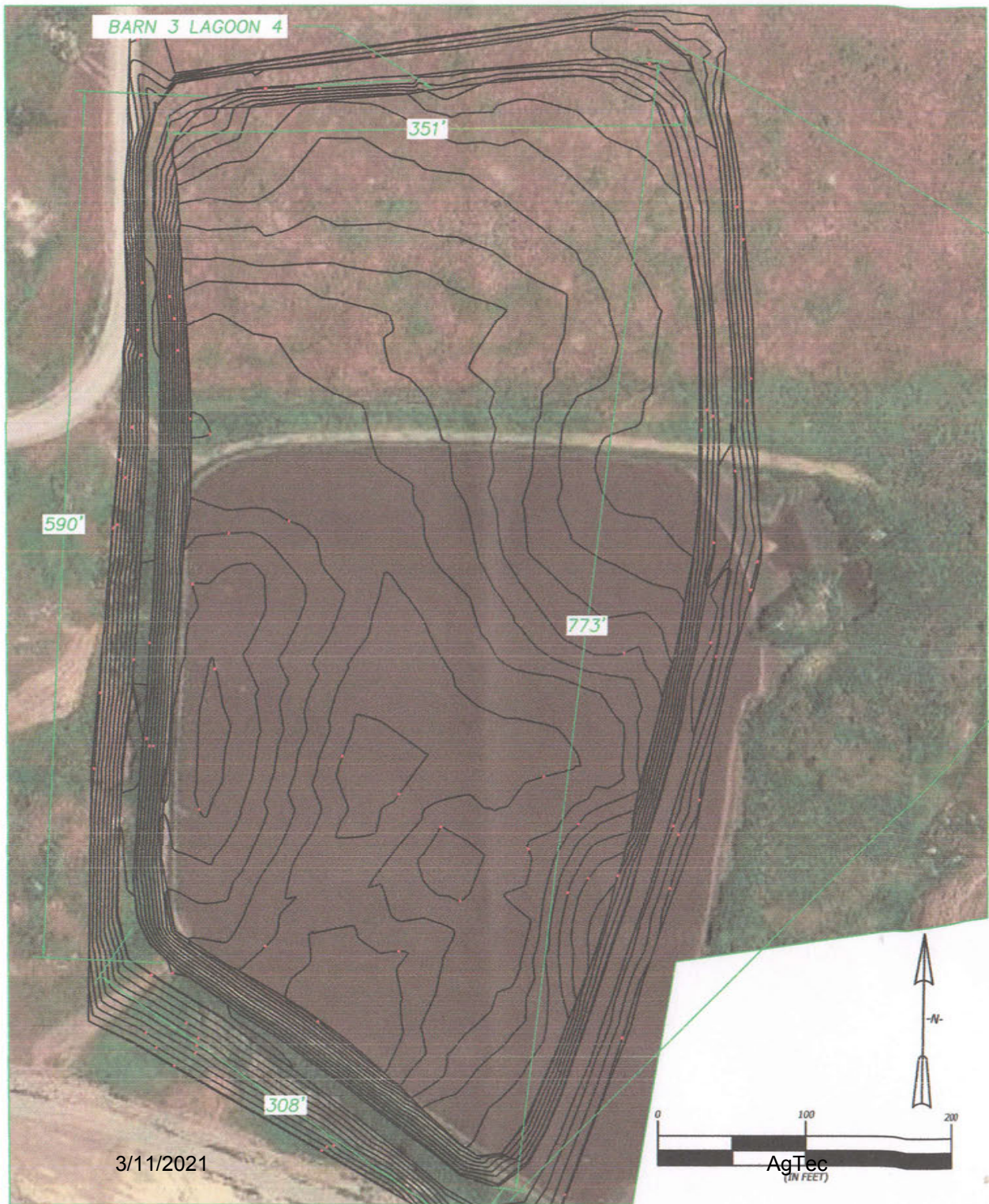
OVERVIEW



Barn 2 Settling Pond 1	
Freeboard (feet)	Volume (cubic feet)
full	68,123
1	51,696
2	36,794
Average Depth	
4 ft	
Bank	
Top Width	
12	
Inside Slope	2.5H:1V
Outside Slope	2.5H:1V



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ENVIRONMENTAL



3/11/2021

AgTec
(IN FEET)

FOUR BROTHERS DAIRY
425 N 250 W
SHOSHONE, ID



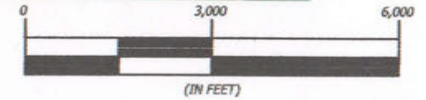
SOUTHWEST VIEW



RIPRAP



OVERVIEW



Barn 3 Lagoon 4	
Freeboard (feet)	Volume (cubic feet)
full	1,558,742
1	1,321,254
2	1,090,411
Average Depth	
6.5 ft	
Bank	
Top Width	
9	
Inside Slope	
3H:1V	
Outside Slope	
3H:1V	

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STATE OF IDAHO

DEPARTMENT OF AGRICULTURE



C.L. "BUTCH" OTTER
Governor
CELIA R. GOULD
Director

October 21, 2016

Matthew W Thompson P.E.
1993 Tamarack Loop
Twin Falls, ID 83301
(208) 731-8640 cell

Via Email: matthewthompson1993@gmail.com


Re: Public Records Request

Dear Mr. Thompson:

On October 21st, 2016, the Idaho State Department of Agriculture, Dairy Bureau, received your email request for "all the pond inspections/approvals for the four brothers dairy."

The following is a list of the documents you requested.

Date	Comment	Page #
06/98 thru 05/15	Construction Reports	21
	Total	21

 An Attorney has reviewed this document.

If you have any questions, please call.

Sincerely,



Mitch Vermeer
Section Manger, Animal Industries
Idaho Department of Agriculture

Certificate of Mailing:

I hereby certify that the original of this letter was emailed on this 21st day of October, 2016.


Witness Signature

CONSTRUCTION INSPECTION REPORT

FACILITY NAME/OWNER/ADDRESS/CITY/PHONE

Four Bro. Dairy
425 N. 250^W Shoshone, ID

Site:

DATE:

5-14-15

TIME:

12:20pm

CONTRACTOR:

Yayiv Weber

PHONE:

324-9256

INSPECTION TYPE:

☐ DURING CONSTRUCTION

☒ FINAL

Facility meets the following siting requirements:

- | | | | |
|--|----------------------------------|---|-----|
| 1. 100' or more from a stream or drain | <input checked="" type="radio"/> | N | N/A |
| 2. 100' from a private domestic well | <input checked="" type="radio"/> | N | N/A |
| 3. 1000' from a public well | <input checked="" type="radio"/> | N | N/A |
| 4. 100' from any residence | <input checked="" type="radio"/> | N | N/A |

Soil Analysis Completed by: NRCS Lab N/A

Limiting Soil Depth: by Rock? Water? Soil?

Liner Required? Y N

Clay content of soil or soil liner: 21%

Maximum Excavation Depth Allowed:

Has facility been properly sized? Y N

by: NRCS

ISDA

U OF I

OTHER Fluckiger

Earthen Storage Pond

Top soil & vegetation cleared from site? ☒ N N/A

Excavation Equipment used:

Core trench installed Y N N/A

Rock encountered during excavation: None Bedrock "Floaters" Gravel

Soil consistent with analysis Y N N/A

How deep was excavation from ground surface?

2' separation from water table? Y N N/A

1' + soil cap over rock? Y N N/A

If soil liner used, minimum thickness is: "

Embankment Lift Thickness: "

Compaction Equipment: Passes/Lift:

Approximate moisture content of soil during placing:

Concrete Storage Pond

Top soil & vegetation cleared from site? Y N N/A

Free draining base under slab Y N

Slab thickness: " Reinforcement: Fiber WWF None

Waterstop installed: PVC/Rubber Betonite Tortuous Path

Wall Height Wall Thickness " with # rebar @ " OC

Wall backfilled with free draining material? Y N N/A

Contraction joints installed Y N Spacing: ' x '

Synthetic Liner Storage Pond

Liner specs & plans approved by: ISDA NRCS Not Approved

Sand or other bedding material placed under liner: Y N

Liner is: one piece seamed by factory personnel

Liner is: UV protected capped with ' of soil

Inside Pond Dimensions

Top Length 477' x Top Width 424' x Depth 8'

Bottom Length ' x Bottom Width '

Inside Slope 2:1 Outside Slope 1:1 Berm Width '

Earthen Berming

Runoff Diversion Berms/Ditches in place: Y N

Runoff Containment Berms in place: Y N

Berm Construction is adequate: Y N

Berm height: '

Testing

Soil Sample Results:

Description	Clay (L/F)	Penetrometer
NW corner	20% 22%	
NE corner	22% 24%	

Comments

This inspection does not constitute county approval of this facility. Consult your county planning department regarding additional county requirements.

lagoon meets ISDA Requirements.
Riprap in place, sides and bottom of
lagoon compacted well.

Construction:

☒ Approved

☐ Not Approved - Action Required (see comments)

Inspector Signature

Aime Blahely

Contractor Signature

Producer Signature

RECEIVED

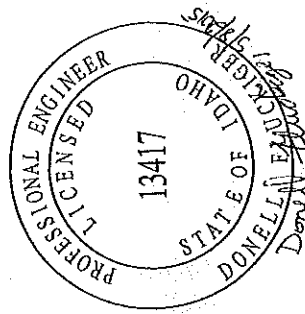
MAY 20 2015

DAIRY BUREAU

NOTES:

- *THE CONTAINMENT POND MEETS ISDA CONSTRUCTION REQUIREMENTS.
- *THE CONTAINMENT AREA WILL SERVE AS ADDITIONAL APPROVED STORAGE FOR THE FACILITY.
- *AT LEAST 2' COVER OVER BEDROCK.
- *THE NATIVE SOIL FROM THE POND RANGE FROM 20-26% CLAY. (SEE ATTACHMENT)
- *THE POND IS COMPACTED EXCEEDING 300 PSI WITH THE COMPACTION TESTER.
- *INSIDE BANK SLOPE IS 3H:1V OR GREATER.
- *OUTSIDE BANK SLOPE IS 2H:1V.
- *TOP OF BANK MINIMUM IS 12'.
- *DELIVERY PIPE CROSS THE CANAL AND ENTERS THE POND ON NORTHEAST CORNER.
- *MEASUREMENTS AND VOLUMES CALCULATED USING LEICA ROBOTIC TOTAL STATION AND CARLSON CIVIL CAD SOFTWARE.
- *PRODUCER/OWNER SHALL MAINTAIN THE DELIVERY PIPE AND POND WHICH INCLUDES PERIODIC INSPECTION, WEED CONTROL, CLEANING AND EROSION CONTROL

CONTAINMENT POND STORAGE	
FREEBOARD (FT)	CAPACITY (CF)
FULL	1,627,537
1	1,374,310
2	1,134,299
≈ 11' MAX POND DEPTH MEASURED NEAR SOUTHWEST CORNER	



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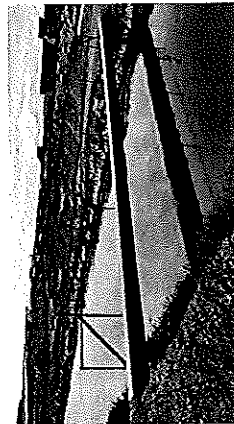




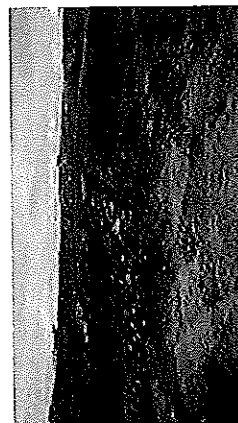
SOUTHWEST PANORAMA POND VIEW



PIPE CROSSING CANAL
SOUTHWEST VIEW



PIPE CROSSING CANAL
SOUTHEAST VIEW



PIPE AND RIPRAP IN
NORTHEAST CORNER

December 2, 2014

HARLEY R. NOE
Phone: 208.850.4926
Fax: 208.939-8602

Donell Fluckiger, PE
Fluckiger Consulting
182 Homestead Loop
Jerome, ID 83338

RE: Soil samples from Four Brothers Dairy

I received four samples you collected from the Four Brothers Dairy located at 425 N, 250 W north of Shoshone and have determined textures and clay contents. You indicated these soils are from the floor of a pond on the site. The table below shows the textures and clay contents observed.

<i>Sample ID (as marked on bag)</i>	<i>Observed Texture</i>	<i>Estimated Clay</i>
NW	silt loam	20 to 22%
NE	silt loam	22 to 24%
SW	silt loam	20 to 22%
SE	silt loam	18 to 20%

All the samples have clay contents well within the required limits for earthen liners. The textures and clay contents seem to be quite uniform across the pond floor. If you have determined compaction to be adequate, these materials should provide a positive seal for the pond. No additional soils related investigation should be required.

If you have any questions please call me at 850-4926 or send me an e-mail at harleynoe@cableone.net.

transmitted via e-mail

HARLEY R. NOE
Professional Soil Scientist

cc: Four Brothers Dairy, 425 N, 250 W, Shoshone, ID 83352

CONSTRUCTION INSPECTION REPORT

FACILITY NAME/OWNER/ADDRESS/CITY/PHONE

Four Brothers Dairy
425 N 250W Shoshone ID
Site: Barn 4 Heiser Corral Runoff Pond

DATE: 1-2-14

TIME: 12:00

CONTRACTOR: Yager Weber

PHONE:

INSPECTION TYPE: ☐ DURING CONSTRUCTION ☒ FINAL

Facility meets the following siting requirements:

- 100' or more from a stream or drain ☒ Y ☒ N N/A
- 100' from a private domestic well ☒ Y ☒ N N/A
- 1000' from a public well ☒ Y ☒ N N/A
- 100' from any residence ☒ Y ☒ N N/A

Soil Analysis Completed by: NRCS Lab Hayden, NE N/A

Limiting Soil Depth: varies by Rock? ☒ Water? ☒ Soil? ☒

Liner Required? native material

Clay content of soil or soil liner: 20-26%

Maximum Excavation Depth Allowed: _____

Has facility been properly sized? Y additional storage

by: NRCS ISDA UOFI OTHER _____

Earthen Storage Pond

Top soil & vegetation cleared from site? ☒ Y ☒ N N/A

Excavation Equipment used: dozer

Core trench installed ☒ Y ☒ N ☒ N/A

Rock encountered during excavation: None ☒ Bedrock ☒ "floaters" ☒ Gravel

Soil consistent with analysis ☒ Y ☒ N N/A

How deep was excavation from ground surface? 4-5'

2' separation from water table? ☒ Y ☒ N N/A

1'± soil cap over rock? ☒ Y ☒ N N/A

If soil liner used, minimum thickness is: 4" native soil

Embankment Lift Thickness: 4-6"

Compaction Equipment: dozer Passes/Lift: _____

Approximate moisture content of soil during placing: _____

Concrete Storage Pond

Top soil & vegetation cleared from site? ☒ Y ☒ N N/A

Free draining base under slab ☒ Y ☒ N

Slab thickness: _____" Reinforcement: Fiber WWF None

Waterstop installed: PVC/Rubber Betonite Tortuous Path

Wall Height _____' Wall Thickness _____" with # _____ rebar @ _____" OC

Wall backfilled with free draining material? ☒ Y ☒ N N/A

Contraction joints installed ☒ Y ☒ N Spacing: _____' x _____'

Synthetic Liner Storage Pond

Liner specs & plans approved by: ISDA NRCS Not Approved

Sand or other bedding material placed under liner: ☒ Y ☒ N

Liner is: _____ one piece _____ seamed by factory personnel

Liner is: _____ UV protected _____ capped with _____' of soil

Inside Pond Dimensions

Top Length _____' x Top Width See file x Depth _____'

Bottom Length _____' x Bottom Width _____'

Inside Slope 2:3 Outside Slope 2:3 Berm Width 10'

Earthen Berming

Runoff Diversion Berms/Ditches in place: ☒ Y ☒ N

Runoff Containment Berms in place: ☒ Y ☒ N

Berm Construction is adequate: ☒ Y ☒ N

Berm height _____'

Testing

Soil Sample Results:

Description all spots Clay (L/F) _____ Penetrometer 300 psi

RECEIVED

JAN 03 2014

DAIRY BUREAU

Comments

This inspection does not constitute county approval of this facility. Consult your county planning department regarding additional county requirements.

It is the owner/producer's responsibility to maintain the pond. This includes maintaining soil depth above rock, cleaning, riprap & rotent control

Construction:

☒ Approved

☐ Not Approved - Action Required (see comments)

Inspector Signature Donna L. H. H. H.

Contractor Signature

Producer Signature Lawrence M. R. H.

Facility Name: Four Brothers Dairy
Owner: Fitzgerald
Address: 425 N 250 W
City/State/zip: Shoshone ID
Phone Number: _____
Site: Barn 5 separator 2

CONSTRUCTION INSPECTION REPORT

Idaho State Department of Agriculture
Animal Industries Division
PO Box 790, Boise Id 83701-0790
(208) 332-8560 334-4062(Fax)

GF9004

Facility meets the following siting requirements:

- | | | | |
|---|----------|---|-----|
| 1. 100' or more from a stream or drain? | <u>Y</u> | N | N/A |
| 2. 100' from a private domestic well? | <u>Y</u> | N | N/A |
| 3. 1000' from a public well? | <u>Y</u> | N | N/A |
| 4. 100' from any residence? | <u>Y</u> | N | N/A |

DATE: 11/27/13 TIME: 10:30
CONTRACTOR: Yager Weber PHONE: _____
INSPECTION TYPE: ☐ DURING CONSTRUCTION ☒ FINAL

Earthen Storage Pond

Top soil & vegetation cleared from site? Y N N/A
Excavation Equipment used: Scraper
Core trench installed? Y N N/A
Rock encountered during excavation:
None Bedrock "Floaters" Gravel
Soil consistent with analysis? Y N N/A
How deep was excavation from ground surface? _____
2' separation from water table? Y N N/A
1'+ soil cap over rock? Y N N/A
If soil liner used, minimum thickness is: existing
Embankment Lift Thickness: 4-6"
Compaction Equipment: dozer/scraper (Passes/Lift: _____)
Approximate moisture content of soil during placing: _____

Concrete Storage Pond

Topsoil & vegetation cleared from site? Y N N/A
Free draining base under slab? Y N
Slab thickness: _____" Reinforcement: Fiber WWF None
Water stop installed: PVC/Rubber Betonite Tortuous Path
Wall Height _____' Wall Thickness _____" with # _____ rebar @ _____" OC
Wall backfilled with free draining material? Y N N/A
Contraction joints installed? Y N Spacing: _____'x_____'

Synthetic Liner Storage Pond

Liner specs & plans approved by: ISDA NRCS Not Approved
Sand or other bedding material placed under liner? Y N
Liner is: _____ one piece _____ seamed by factory personnel
Liner is: _____ UV protected _____ Capped with _____' of soil

Earthen Berming

Runoff Diversion Berms/Ditches in place? Y N
Runoff Containment Berms in place? Y N
Berm Construction is adequate? Y N
Berm height _____ ft.

Inside Pond Dimensions

Top Length 225' x Top Width 159' x Depth 0-7'
Bottom Length _____' x Bottom Width _____'
Inside Slope 2:1 Outside Slope _____:1 Berm Width 10+'

Soil Analysis Completed by: "NRCS" Lab Hackley/NRCS
Limiting Soil Depth: varies by Rock? Water? Soil?
Liner Required? native material
Clay content of soil or soil liner: 20%
Maximum Excavation Depth Allowed: _____
Has facility been properly sized? Y
by: NRCS ISDA U OF I additional separator OTHER _____

Testing

Soil Sample Results:

Description	Clay (L/F)	Penetrometer
<u>all spots</u>	_____	<u>7300 psi</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____

Comments

This inspection does not constitute county approval of this facility.
Consult your county planning department regarding additional county requirements.

It is the owner/producer's responsibility to maintain the separator.

REC'D DEC 06 2013

Construction:

☒ Approved

☐ Not Approved - Action Required (see comments)

Inspector Signature: _____

Contractor Signature: _____

Producer Signature: _____



FOUR BROTHERS
425 N 250 W
SHOSHONE, ID

BARN 5 NORTH SEPARATOR

Separator

DEPTH RANGE
0-7'

225

95'

OVERVIEW MAP

November 5, 2013

HARLEY R. NOE
Phone: 208.850.4926
Fax: 208.939-8602

Donnell Fluckiger
ISDA
1180 Washington St. N.
Twin Falls, ID 83301

RE: Grab sample analysis from Four Brothers Dairy

Today I evaluated ten samples you collected from the Four Brothers Dairy located at 425 N, 250 W north of Shoshone. The samples are from various locations as shown in the following table along with texture and clay content I determined.

<i>Sample ID (as marked on bag)</i>	<i>Observed Texture</i>	<i>Estimated Clay</i>
South of Canal		
east	silt loam	22 to 24%
west	silt loam	22 to 24%
Barn 5 - North settling pond		
NG Bottom	silt loam	22 to 24%
SW Bottom	silt loam	20 to 22%
Center Bottom	silt loam	22 to 24%
NW Bottom	silt loam	24 to 26%
Heifer Corral runoff pond		
E Bottom	silt loam	22 to 24%
N Bottom	silt loam	21 to 23%
SE Bottom	silt loam	24 to 26%
SW Bottom	silt loam	24 to 26%

All of the samples have clay contents well above the required limits and should be considered good liner materials. If you determine the soil has been properly placed and compacted it should provide a positive seal for any pond.

If you have any questions, please call me at 850-4926.

transmitted via e-mail

HARLEY R. NOE
Professional Soil Scientist

cc: Four Brothers Dairy, 425 N, 250 W, Shoshone, ID

#4

KC

Facility Name: Fox Brothers Dairy #5

Owner:

Address: 520 N 260 WCity/State/zip: Shoshone, IDPhone Number: #4Site: Barn 5 South Settling cell**CONSTRUCTION INSPECTION REPORT**

Idaho State Department of Agriculture

Animal Industries Division

PO Box 790, Boise ID 83701-0790

(208) 332-8560 334-4062(Fax)

Facility meets the following siting requirements:

- | | | | |
|---|----------|---|-----|
| 1. 100' or more from a stream or drain? | <u>Y</u> | N | N/A |
| 2. 100' from a private domestic well? | <u>Y</u> | N | N/A |
| 3. 1000' from a public well? | <u>Y</u> | N | N/A |
| 4. 100' from any residence? | <u>Y</u> | N | N/A |

DATE: 2/8/2012TIME: 1:00CONTRACTOR: Yager/Weber

PHONE:

INSPECTION TYPE: ☐ DURING CONSTRUCTION ☒ FINAL**Earthen Storage Pond**Top soil & vegetation cleared from site? Y N N/AExcavation Equipment used: dozer/catCore trench installed? Y N N/A

Rock encountered during excavation:

None Bedrock "Floaters" GravelSoil consistent with analysis? Y N N/AHow deep was excavation from ground surface? 12.62' separation from water table? Y N N/A1'+ soil cap over rock? Y N N/AIf soil liner used, minimum thickness is: 24"Embankment Lift Thickness: 4.6"Compaction Equipment: dozer/cat Passes/Lift:

Approximate moisture content of soil during placing:

Concrete Storage PondTopsoil & vegetation cleared from site? Y N N/AFree draining base under slab? Y NSlab thickness: " Reinforcement: Fiber WWF None

Water stop installed: PVC/Rubber Betonite Tortuous Path

Wall Height ' Wall Thickness " With # rebar @ " OCWall backfilled with free draining material? Y N N/AContraction joints installed? Y N Spacing: 'x**Synthetic Liner Storage Pond**

Liner specs & plans approved by: ISDA NRCS Not Approved

Sand or other bedding material placed under liner? Y NLiner is: one piece seamed by factory personnelLiner is: UV protected Capped with ' of soil**Earthen Berming**Runoff Diversion Berms/Ditches in place? Y NRunoff Containment Berms in place? Y NBerm Construction is adequate? Y NBerm height ft.**Inside Pond Dimensions**Top Length 475' x Top Width 84' x Depth 6.11'Bottom Length ' x Bottom Width 'Inside Slope 23:1 Outside Slope 23:1 Berm Width 10'Soil Analysis Completed by: NRCS Lab Boise N/ALimiting Soil Depth: 0.5' by Rock? Water? Soil?Liner Required? Y NClay content of soil or soil liner: 17-19%Maximum Excavation Depth Allowed: 'Has facility been properly sized? Y Nby: NRCS ISDA U OF I OTHER AgTec**Testing**

Soil Sample Results:

Description Clay (L/F) Penetrometer

all spots 2300 psi**Comments**

This inspection does not constitute county approval of this facility. Consult your county planning department regarding additional county requirements.

It is the producer's responsibility to maintain the pond - including cleaning/weed control.
Pond banks will not be built up as indicated in the previous inspection.

Construction:☒ Approved☐ Not Approved - Action Required (see comments)

Inspector Signature:

Contractor Signature

Producer Signature

CONSTRUCTION INSPECTION REPORT

DAIRY NAME/OWNER/ADDRESS/CITY/PHONE

Four Brothers Dairy 886-7716
427 N 250 W
Shoshone, ID

DATE: 11/16/11

TIME: 10:30

CONTRACTOR: Jager

PHONE:

INSPECTION TYPE:

☐ PRELIMINARY

☒ FINAL

Facility meets the following siting requirements:

- | | | | |
|--|---|---|-----|
| 1. 100' or more from a stream or drain | Y | N | N/A |
| 2. 100' from a private domestic well | Y | N | N/A |
| 3. 1000' from a public well | Y | N | N/A |
| 4. 100' from any residence | Y | N | N/A |
| 5. County P & Z Approval | Y | N | N/A |
| 6. Irrigation & Hwy. District Approval | Y | N | N/A |

Soil Analysis Completed by: NRCS Lab Boise N/A

Limiting Soil Depth: _____ by Rock? Water? Soil?

Liner Required? Y N

Clay content of soil or soil liner: See file %

Maximum Excavation Depth Allowed: _____

Has facility been properly sized? Y N

by: NRCS ISDA U OF I Additional Storage OTHER

Earthen Storage Pond

Top soil & vegetation cleared from site? Y N N/A

Excavation Equipment used: Dozer

Core trench installed Y N N/A

Rock encountered during excavation: None Bedrock "Floaters" Gravel

Soil consistent with analysis Y N N/A

How deep was excavation from ground surface? 5'

2' separation from water table? Y N N/A

1' + soil cap over rock? Y N N/A

If soil liner used, minimum thickness is: 12"

Embankment Lift Thickness: 4"

Compaction Equipment: Dozer Passes/Lift: _____

How was water added to embankment? _____

Approximate moisture content of soil during placing: _____

Concrete Storage Pond

Top soil & vegetation cleared from site? Y N N/A

Free draining base under slab Y N

Slab thickness: _____ Reinforcement: Fiber WWF None

Waterstop installed: PVC/Rubber Betonite Tortuous Path

Wall Height _____ Wall Thickness _____ with # _____ rebar @ _____ OC

Wall backfilled with free draining material? Y N N/A

Contraction joints installed Y N Spacing: _____'x_____'

Synthetic Liner Storage Pond

Liner specs & plans approved by: ISDA NRCS Not Approved

Sand or other bedding material placed under liner Y N

Liner is: _____ one piece _____ seamed by factory personnel

Liner is: _____ UV protected _____ Capped with _____ of soil

Inside Pond Dimensions

Top Length 77' x Top Width 67' x Depth 4 1/2'

Bottom Length _____ x Bottom Width _____

Inside Slope 2:1 Outside Slope 1:1 Berm Width 8'

Testing

Soil Sample Results:

Description	Clay (L/F)	Penetrometer
<u>all spots</u>	<u>1</u>	<u>7300psi</u>

Comments

This inspection does not constitute county approval.

Area must be maintained including clearing and weed control.

RECEIVED

DEC 01 2011

DAIRY BUREAU

Construction:

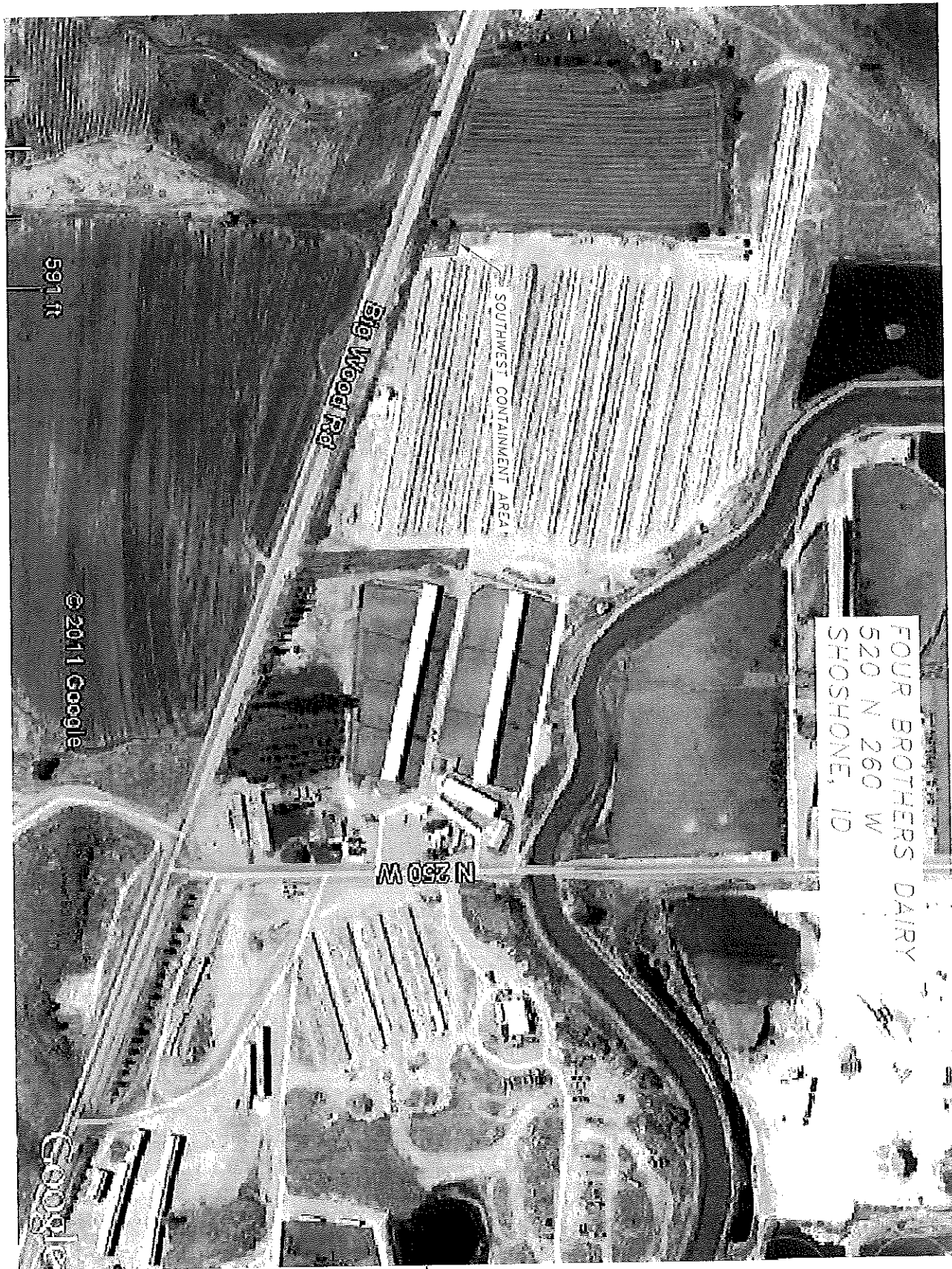
☐ Approved

☐ Not Approved - Action Required (see comments)

Contractor Signature

Inspector Signature

Producer Signature





SOIL INVENTORY AND EVALUATION OF
ANIMAL WASTE POND SITES
BY THE
NATURAL RESOURCES CONSERVATION SERVICE

REQUESTED BY: Donnell Fluckiger
ADDRESS: Four Brothers Dairy
ADDRESS: Shoshone, ID
PHONE:
ASSISTED BY: Rod Kyar, Assistant State Soil Scientist
DATE: 10/4/2011

LOCATION	SOIL TEXTURE	% CLAY	% PASSING 200 SIEVE	PI INDEX	SOIL GROUP
Calf facility, sample 1	sil	17	80	12	III
Calf facility, sample 2	sil	19	80	14	III
NOTES:					

CONSTRUCTION INSPECTION REPORT

DAIRY NAME/OWNER/ADDRESS/CITY/PHONE

4 Bros. Dairy #2
445 North 250 West
Shoshone, ID.

DATE: 10-20-10

TIME:

CONTRACTOR: Dennis Myers

PHONE:

INSPECTION TYPE:

☐ PRELIMINARY

☒ FINAL

Facility meets the following siting requirements:

- | | | | |
|--|---|---|-----|
| 1. 100' or more from a stream or drain | Y | N | N/A |
| 2. 100' from a private domestic well | Y | N | N/A |
| 3. 1000' from a public well | Y | N | N/A |
| 4. 100' from any residence | Y | N | N/A |
| 5. County P & Z Approval | Y | N | N/A |
| 6. Irrigation & Hwy. District Approval | Y | N | N/A |

Soil Analysis Completed by: NRCS Lab USDA Lab N/A

Limiting Soil Depth: by Rock? Water? Soil?

Liner Required? Y N

Clay content of soil or soil liner: 17-27 %

Maximum Excavation Depth Allowed:

Has facility been properly sized? Y N

by: NRCS ISDA U OF I OTHER

Earthen Storage Pond

Top soil & vegetation cleared from site? Y N N/A

Excavation Equipment used: Dozer

Core trench installed Y N N/A

Rock encountered during excavation: None Bedrock "Floaters" Gravel

Soil consistent with analysis Y N N/A

How deep was excavation from ground surface? 8' "

2' separation from water table? Y N N/A

1' + soil cap over rock? Y N N/A

If soil liner used, minimum thickness is:

Embankment Lift Thickness:

Compaction Equipment: Passes/Lift:

How was water added to embankment?

Approximate moisture content of soil during placing:

Lagoon #1 375 x 330 Inside Pond Dimensions Lagoon 2 370 x 200

Top Length ' x Top Width ' x Depth 6

Bottom Length ' x Bottom Width

Inside Slope 3:1 Outside Slope 2:1 Berm Width 10

Concrete Storage Pond

Top soil & vegetation cleared from site? Y N N/A

Free draining base under slab Y N

Slab thickness: Reinforcement: Fiber WWF None

Waterstop installed: PVC/Rubber Betonite Tortuous Path

Wall Height ' Wall Thickness ' with # rebar @ " OC

Wall backfilled with free draining material? Y N N/A

Contraction joints installed Y N Spacing: ' x

Synthetic Liner Storage Pond

Liner specs & plans approved by: ISDA NRCS Not Approved

Sand or other bedding material placed under liner Y N

Liner is: one piece seamed by factory personnel

Liner is: UV protected Capped with of soil

Pond Bottom well compacted Y N

Embankments well compacted Y N

Runoff Diversions in place Y N N/A

NRCS has approved construction Y N N/A

Testing

Soil Sample Results:

Description	Clay (L/F)	Penetrometer
Lagoon 1	17%	
Lagoon 2		
NW	27%	
SE	24%	
SW	22%	

Comments

Lagoons were emptied to inspect bottom for rock - Bottom of ponds look good - Compaction - 300+ penetrometer Rps - RAP under piping looks good -

Soil samples had adequate clay content

RECEIVED

OCT 29 2010

DAIRY BUREAU

Construction:

☒ Approved

☐ Not Approved - Action Required (see comments)

Contractor Signature

Producer Signature

Inspector Signature

K. Brown

10-20-10

DAIRY FARM WASTE
FACILITY INSPECTION REPORT

DAIRY NAME/OWNER/ADDRESS/CITY 4 Bros. Dairy #2 445 N. 420 N. Shoshone, ID.	DATE: 10-4-10	INSPECTION TYPE: <input type="checkbox"/> ROUTINE <input checked="" type="checkbox"/> FOLLOW-UP <input type="checkbox"/> PRE-QUALIFYING <input type="checkbox"/> QUALIFYING <input type="checkbox"/> OTHER <input type="checkbox"/> COMPLAINT:	REPEAT NON-COMPLIANCE
	TIME: 10:30 # OF ANIMALS: 850 Fresh & Dry: 850 Replacements:		TIME FRAME:
PLANT/PERMIT #: GF-9010			DISCHARGE INSPECTION
			REVOKE MILK PERMIT
			ADMINISTRATIVE HEARING

A dairy farm waste facility inspection was conducted at your facility on this date. Items found to be in non-compliance with IDAPA 02.04.14 are identified below. Please be aware that repeat non-compliance items found to exist on the next inspection may be cause for revocation of your permit to sell milk.

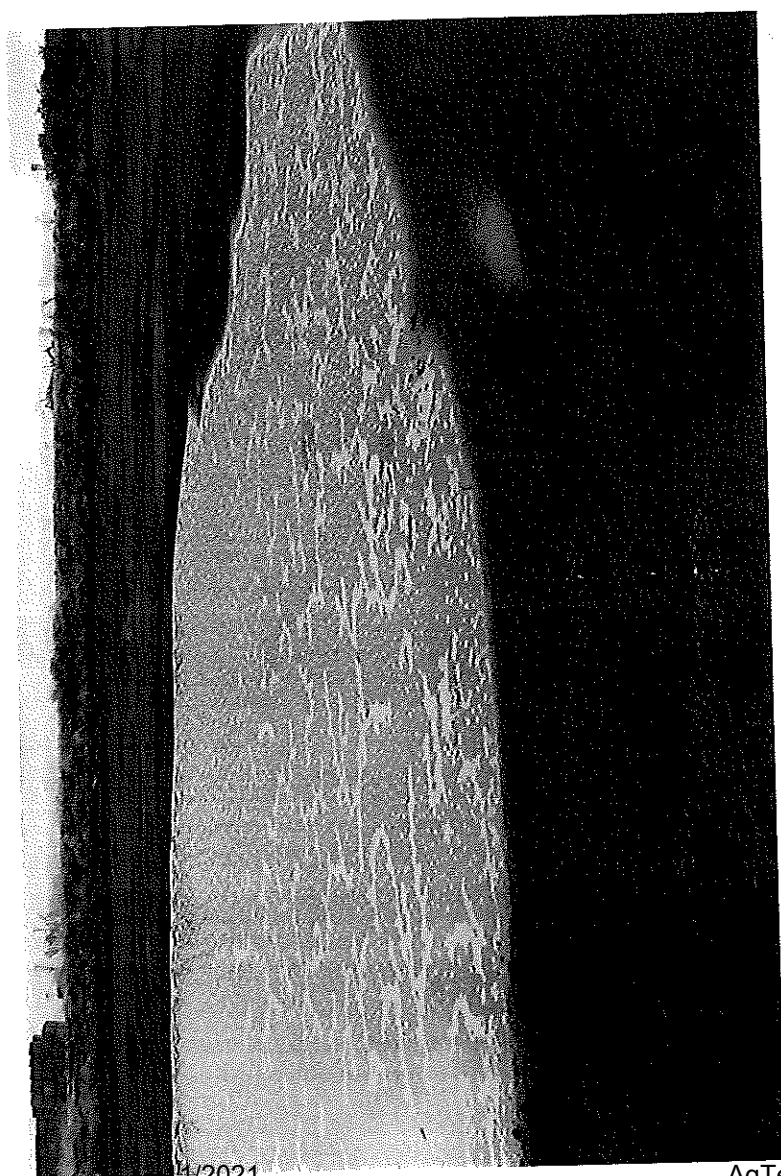
ITEM/DESCRIPTION	Comment	Non-Compliance	Discharge	Remarks:
1. WASTE SYSTEM				<p>This inspection is a follow-up to previous construction reports. File was missing final construction approval inspection report.</p> <p>Producer has lowered lagoons for bottom inspection and new soil samples were taken. When soil sample results are received a final inspection will be made of the waste system if clay content is adequate.</p> <p>RECEIVED OCT 12 2010 DAIRY BUREAU</p>
a. Barn Waste Containment				
Type:				
Freeboard:				
b. Corral/Facility Containment				
<input type="checkbox"/> In-Corral <input type="checkbox"/> Pond				
c. Separation System				
d. Construction Approved				
e. Adequate Liquid Storage				
f. Waste Facilities Well Maintained				
g. Evidence of Past Discharge				
h. Animals Confined From Waterways				
2. NUTRIENT MANAGEMENT				
a. Nutrient Management Plan				
1. Crop Rotation and Yield				
2. Animal Numbers				
3. Barn Water Use				
4. Waste Export				
b. Record Keeping Current				
c. Liquid Application				
d. Solid Application				

Idaho Rules Governing Dairy Waste, IDAPA 02.04.14 state that should a repeat item(s) on non-compliance or if a significant item(s) is found to exist on an inspection, a reinspection shall be required after the time deemed necessary to remedy the item(s) of non-compliance. Any significant or repeat item(s) of non-compliance found still existing at the time of the reinspection may call for revocation of your permit to sell milk. If the permit has been revoked a reinspection will be made when the department has been notified that the problem(s) has been corrected.

INSPECTOR SIGNATURE
Kari Brown

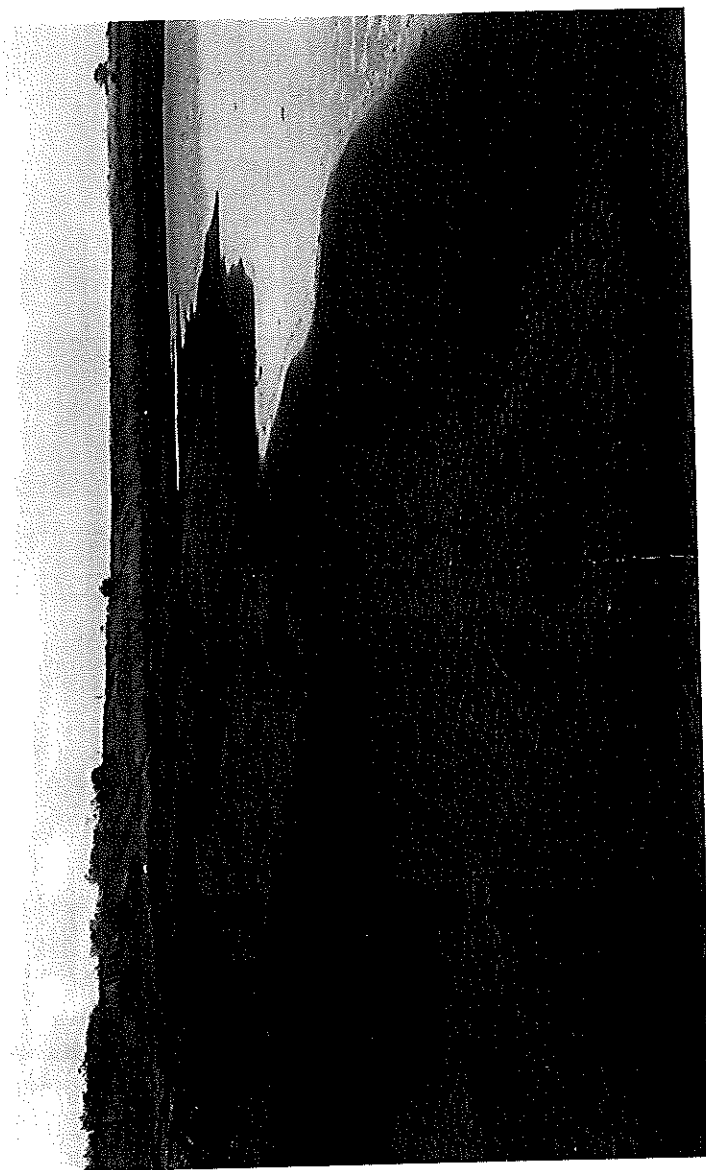
PRODUCER SIGNATURE

4 Bros. ⁷/₈ d
Waste System
Lagoon #2
10/4/10



5/14/2021

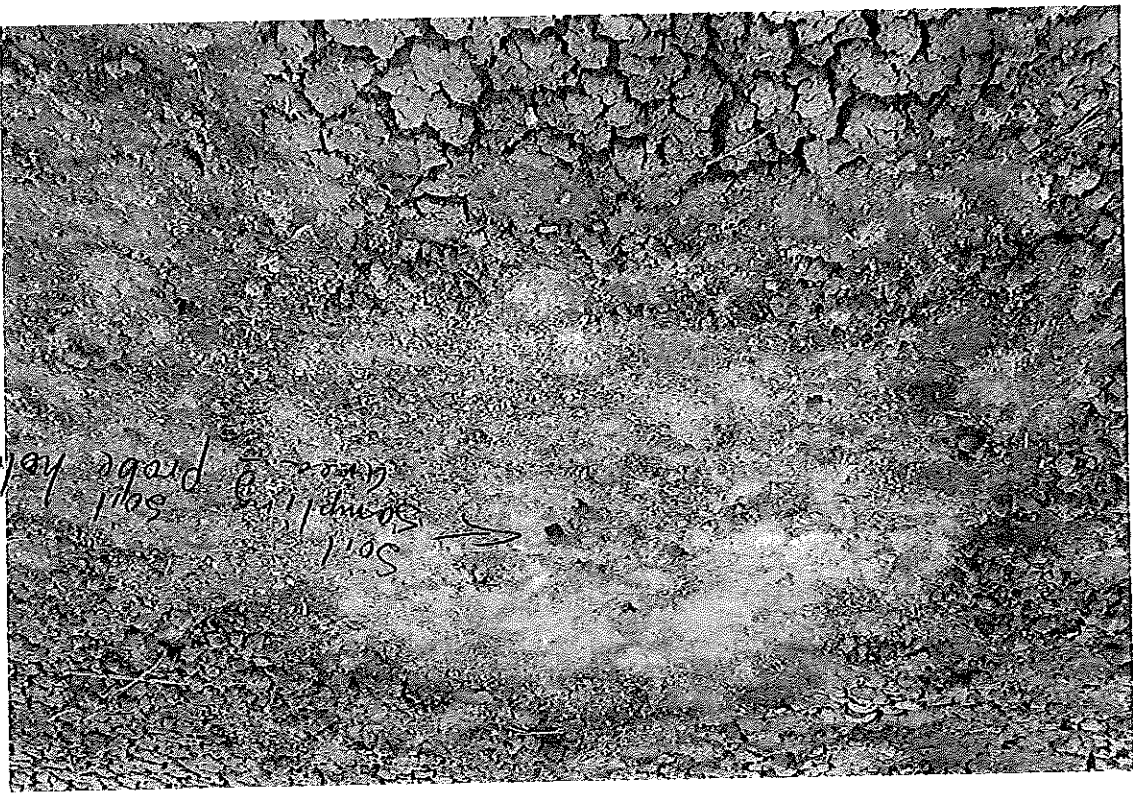
AgTec



Page 428

1
Lagoon #2

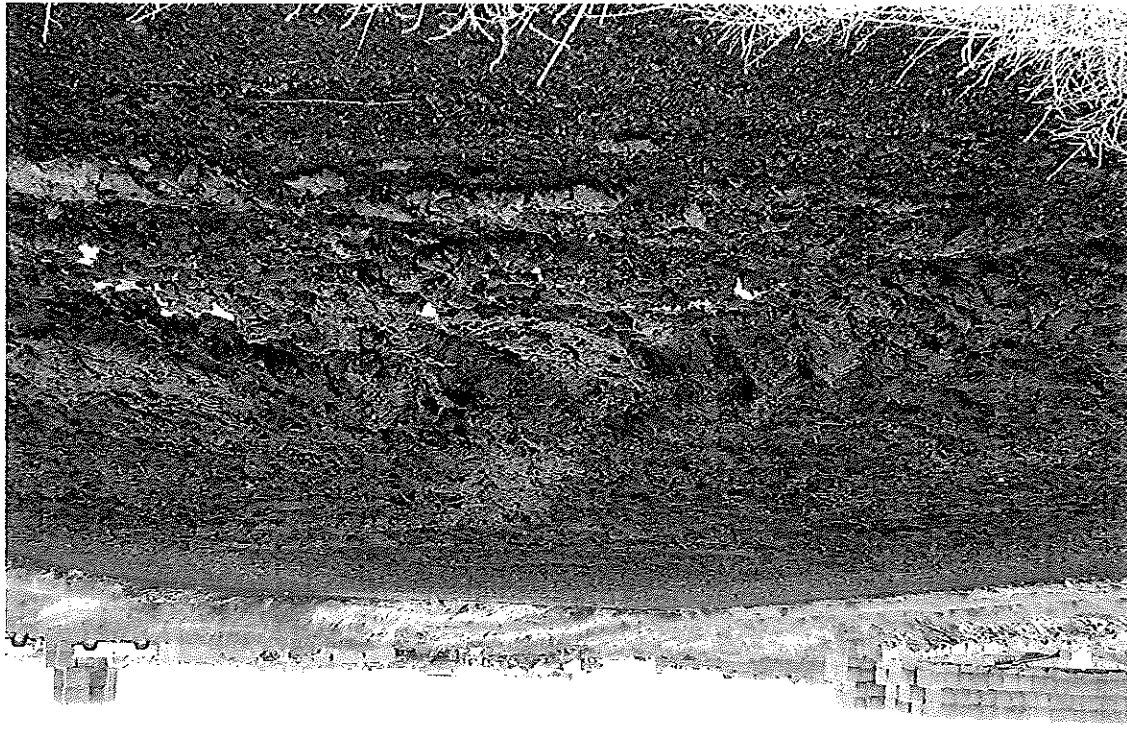
Soil
Sampling
area
probe holes



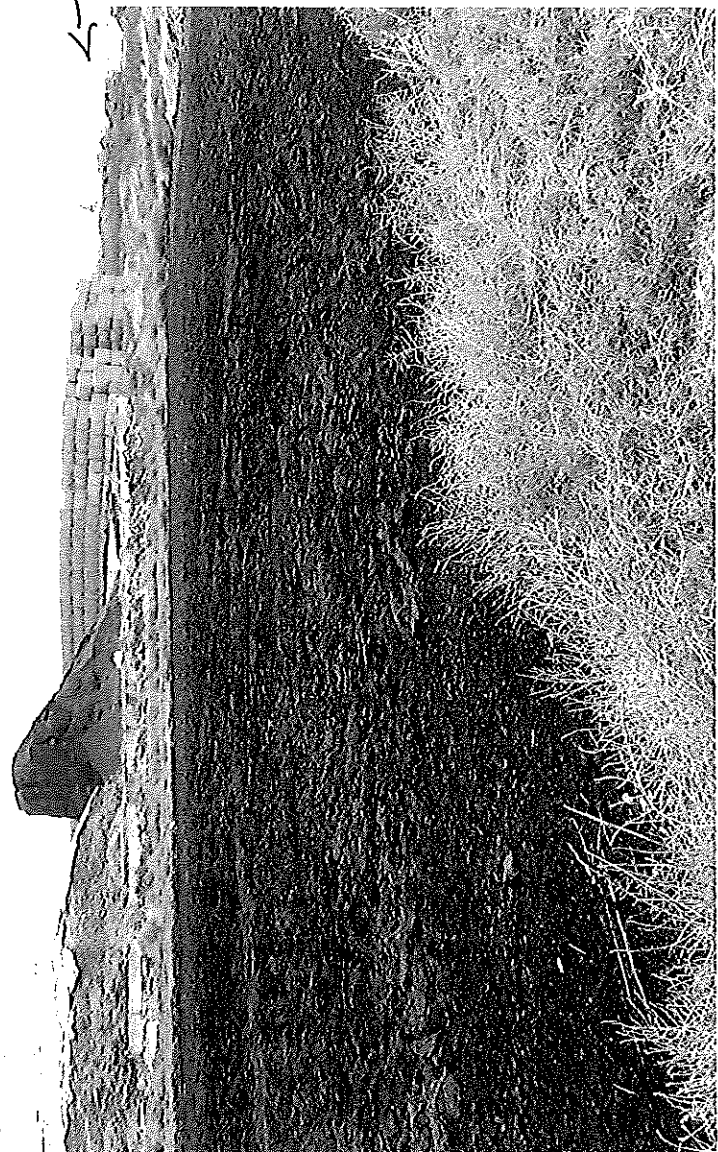
W-1-110
4 Bros. Dairy
#2

← settling
cell

← settling
cell



← Soil Sampling area - Lagoon #1



4 Bros. Dairy Barn ←
10-4-10

Lagoon #1
1/1

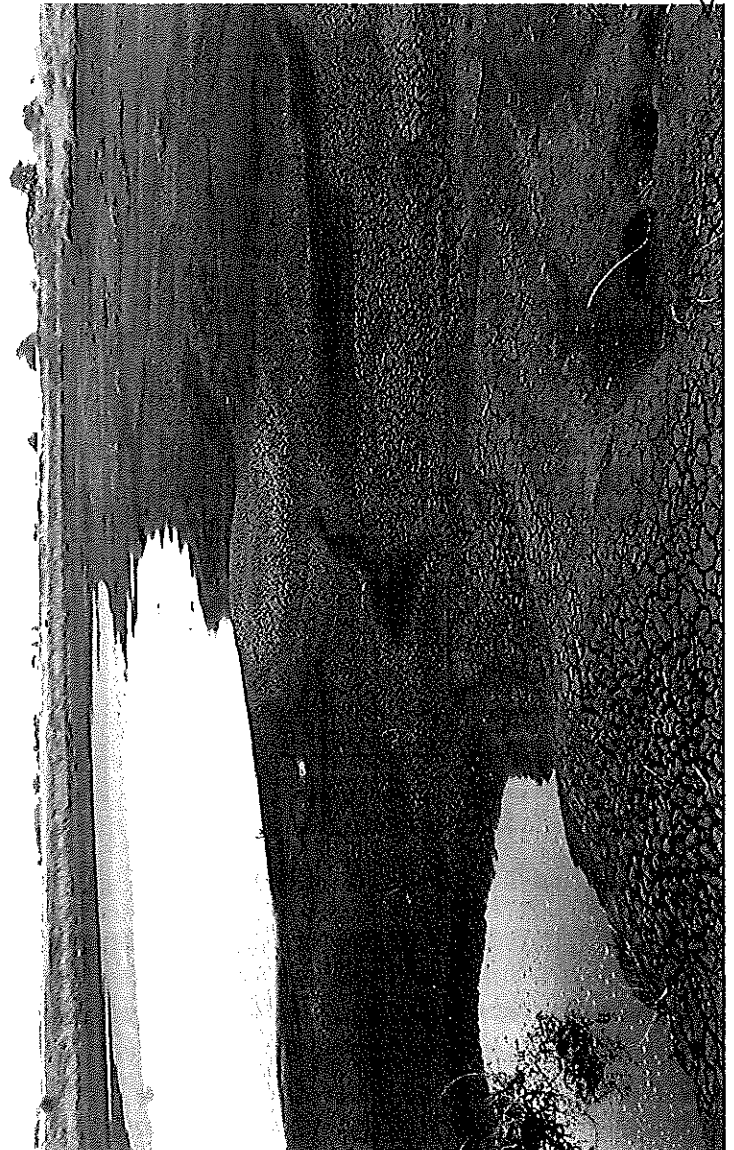


Lagoon #1



3/11/2021

AgTec



Page 431

← Lagoon #2

mc.m

IDAHO DEPARTMENT OF AGRICULTURE
BUREAU OF DAIRYING
PO BOX 790, BOISE ID 83701-0790
(208)332-8550 334-4062(fax)

CONSTRUCTION INSPECTION REPORT

DAIRY NAME/OWNER/ADDRESS/CITY/PHONE

4 Brothers Dairy #2
427N 250W
Shoshone

DATE: 1-21-99

TIME: 2:45

CONTRACTOR: Myers

PHONE:

INSPECTION TYPE: ☐ PRELIMINARY ☒ FINAL

Facility meets the following siting requirements:

- | | | | |
|--|------------------------------------|-------------------------|-----|
| 1. 100' or more from a stream or drain | <input checked="" type="radio"/> Y | <input type="radio"/> N | N/A |
| 2. 100' from a private domestic well | <input checked="" type="radio"/> Y | <input type="radio"/> N | N/A |
| 3. 1000' from a public well | <input checked="" type="radio"/> Y | <input type="radio"/> N | N/A |
| 4. 100' from any residence | <input checked="" type="radio"/> Y | <input type="radio"/> N | N/A |
| 5. County P & Z Approval | <input type="radio"/> Y | <input type="radio"/> N | N/A |
| 6. Irrigation & Hwy. District Approval | <input type="radio"/> Y | <input type="radio"/> N | N/A |

Soil Analysis Completed by: NRCS Lab N/A
Limiting Soil Depth: _____ " by Rock? Water? Soil?
Liner Required? ☐ Y ☒ N
Clay content of soil or soil liner: 10+ %
Maximum Excavation Depth Allowed: _____ "
Has facility been properly sized? ☒ Y ☐ N
by: NRCS ☒ ISDA ☐ U OF I OTHER _____

Earthen Storage Pond

Top soil & vegetation cleared from site? ☒ Y ☐ N N/A
Excavation Equipment used: CAT (Digger)
Core trench installed ☐ Y ☐ N ☒ N/A
Rock encountered during excavation: None ☒ Bedrock ☐ "Floaters" ☐ Gravel
Soil consistent with analysis ☒ Y ☐ N N/A
How deep was excavation from ground surface? _____ "
2' separation from water table? ☒ Y ☐ N N/A
1' + soil cap over rock? ☒ Y ☐ N N/A
If soil liner used, minimum thickness is: 12-14 "
Embankment Lift Thickness: _____ "
Compaction Equipment: Digger Passes/Lift: _____
How was water added to embankment? _____
Approximate moisture content of soil during placing: _____

Concrete Storage Pond

Top soil & vegetation cleared from site? ☐ Y ☐ N N/A
Free draining base under slab ☐ Y ☐ N
Slab thickness: _____ " Reinforcement: Fiber WWF None
Waterstop installed: PVC/Rubber ☐ Concrete Tortuous Path
Wall Height _____ ' Wall Thickness _____ ' with # _____ rebar @ _____ " OC
Wall backfilled with free draining material? ☐ Y ☐ N N/A
Contraction joints installed ☐ Y ☐ N Spacing: _____ 'x _____ '

Synthetic Liner Storage Pond

Liner specs & plans approved by: ISDA NRCS Not Approved
Sand or other bedding material placed under liner ☐ Y ☐ N
Liner is: _____ one piece _____ seamed by factory personnel
Liner is: _____ UV protected _____ Capped with _____ ' of soil

Inside Pond Dimensions

see comments

Top Length _____ ' x Top Width _____ ' x Depth _____ '
Bottom Length _____ ' x Bottom Width _____ '
Inside Slope _____ :1 Outside Slope _____ :1 Berm Width _____ '

Pond Bottom well compacted ☒ Y ☐ N
Embankments well compacted ☒ Y ☐ N
Runoff Diversions in place ☐ Y ☐ N ☒ N/A
NRCS has approved construction ☐ Y ☐ N ☒ N/A

Testing

Soil Sample Results:

Description	Clay (L/F)	Penetrometer
<u>All locations</u>	<u>---</u>	<u>300+</u>

Comments

1) Lagoon #3
a) Dimensions avg. 100' x 265' x 9' 2:1
V = 157,483 CF w/ 8' liquid depth
b) all rock has been covered with
1' + of clay soil
2) Lagoon #4
a) avg Dimensions 100' x 230' x 4' 3:1
V = 54,906 CF w/ avg 3' liq. depth
b) rock lying on south embankment
has been removed

Construction:

- ☒ Approved
☐ Not Approved - Action Required (see comments)

Inspector Signature

Trevor C. Kato

Contractor Signature

Producer Signature

Andrew F. Jager

MEM

IDAHO DEPARTMENT OF AGRICULTURE
BUREAU OF DAIRYING
PO BOX 790, BOISE ID 83701-0790
(208)332-8550 334-4062(fax)

CONSTRUCTION INSPECTION REPORT

DAIRY NAME/OWNER/ADDRESS/CITY/PHONE

Four Brothers
Lagoon #2

DATE: June 12, 1998

TIME: 5:20

CONTRACTOR: Meyers

PHONE:

INSPECTION TYPE: ☐ PRELIMINARY ☒ FINAL

Facility meets the following siting requirements:

- | | | | |
|--|------------------------------------|-------------------------|--------------------------------------|
| 1. 100' or more from a stream or drain | <input checked="" type="radio"/> Y | <input type="radio"/> N | <input type="radio"/> N/A |
| 2. 100' from a private domestic well | <input checked="" type="radio"/> Y | <input type="radio"/> N | <input type="radio"/> N/A |
| 3. 1000' from a public well | <input checked="" type="radio"/> Y | <input type="radio"/> N | <input type="radio"/> N/A |
| 4. 100' from any residence | <input checked="" type="radio"/> Y | <input type="radio"/> N | <input type="radio"/> N/A |
| 5. County P & Z Approval | <input checked="" type="radio"/> Y | <input type="radio"/> N | <input type="radio"/> N/A |
| 6. Irrigation & Hwy. District Approval | <input checked="" type="radio"/> Y | <input type="radio"/> N | <input checked="" type="radio"/> N/A |

Soil Analysis Completed by: NRCS Lab Shakenholtz N/A

Limiting Soil Depth: _____ by Rock? Water? Soil?

Liner Required? ☒ Y ☒ N

Clay content of soil or soil liner: 18+ %

Maximum Excavation Depth Allowed: _____

Has facility been properly sized? ☒ Y ☐ N

by: NRCS ☒ ISDA ☐ U OF I ☐ OTHER _____

Earthen Storage Pond

- Top soil & vegetation cleared from site? ☒ Y ☐ N ☐ N/A
- Excavation Equipment used: Scaper/Dozer
- Core trench installed: ☒ Y ☒ N ☐ N/A
- Rock encountered during excavation: None ☒ Bedrock ☒ "Floaters" ☐ Gravel
- Soil consistent with analysis ☒ Y ☐ N ☐ N/A
- How deep was excavation from ground surface? 100 "
- 2' separation from water table? ☒ Y ☐ N ☐ N/A
- 1' +/- soil cap over rock? ☒ Y ☐ N ☐ N/A

If soil liner used, minimum thickness is: _____

Embankment Lift Thickness: _____

Compaction Equipment: Dozer Passes/Lift: _____

How was water added to embankment? Precipitation

Approximate moisture content of soil during placing: 100% FC

Concrete Storage Pond

- Top soil & vegetation cleared from site? ☒ Y ☐ N ☐ N/A
- Free draining base under slab ☒ Y ☐ N
- Slab thickness: _____" Reinforcement: ☒ Fiber ☐ WWF ☐ None
- Waterstop installed: ☒ PVC/Rubber ☐ Betonite ☐ Tortuous Path
- Wall Height: _____' Wall Thickness: _____' with # _____ rebar @ _____" OC
- Wall backfilled with free draining material? ☒ Y ☐ N ☐ N/A
- Contraction joints installed ☒ Y ☐ N Spacing: _____'x _____'

Synthetic Liner Storage Pond

- Liner specs & plans approved by: ISDA ☒ NRCS ☐ Not Approved
- Sand or other bedding material placed under liner ☒ Y ☐ N
- Liner is: ☒ one piece ☐ seamed by factory personnel
- Liner is: ☒ UV protected ☐ Capped with _____' of soil

Inside Pond Dimensions

Top Length See attached drawing x Top Width See attached drawing x Depth See attached drawing

Bottom Length _____' x Bottom Width _____'

Inside Slope _____:1 Outside Slope _____:1 Berm Width _____'

- Pond Bottom well compacted ☒ Y ☐ N
- Embankments well compacted ☒ Y ☐ N
- Runoff Diversions in place ☒ Y ☐ N ☐ N/A
- NRCS has approved construction ☒ Y ☐ N ☒ N/A

Testing

Soil Sample Results:

Description	Clay (L/F)	Penetrometer
All spots	_____	+300
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Comments

- ① Compaction looks excellent!
- ② Looks great!
- ③ Lagoons 1, 3, 3 are not approved and cannot be utilized until they are approved by an employee of the Bureau of Dairying, Department of Agriculture.

Construction:

☒ Approved

☐ Not Approved - Action Required (see comments)

Inspector Signature

Amber Bader

Contractor Signature

Producer Signature

CONSTRUCTION INSPECTION REPORT

DAIRY NAME/OWNER/ADDRESS/CITY/PHONE

4300 Dairy Barn #2

Shenandoah Idaho

Lagoon #1
North Lagoon

DATE: 6/22/98

TIME: 11:30 AM

CONTRACTOR:

PHONE:

INSPECTION TYPE:

☐ PRELIMINARY

☒ FINAL

Facility meets the following siting requirements:

- | | | | |
|--|---------------------------------------|---|-----|
| 1. 100' or more from a stream or drain | <input checked="" type="checkbox"/> Y | N | N/A |
| 2. 100' from a private domestic well | <input checked="" type="checkbox"/> Y | N | N/A |
| 3. 1000' from a public well | <input checked="" type="checkbox"/> Y | N | N/A |
| 4. 100' from any residence | <input checked="" type="checkbox"/> Y | N | N/A |
| 5. County P & Z Approval | Y | N | N/A |
| 6. Irrigation & Hwy. District Approval | Y | N | N/A |

Soil Analysis Completed by: NRCS Lab _____ N/A

Limiting Soil Depth: _____ by Rock? Water? Soil?

Liner Required? Y N

Clay content of soil or soil liner: _____ %

Maximum Excavation Depth Allowed: _____ "

Has facility been properly sized? Y N

by: NRCS ☒ ISDA ☐ U OF I ☐ OTHER _____

Earthen Storage Pond

Top soil & vegetation cleared from site? ☒ Y N N/A

Excavation Equipment used: D8 Cat + Scraper

Core trench installed Y N N/A

Rock encountered during excavation: None Bedrock "Floaters" Gravel

Soil consistent with analysis ☒ Y N N/A

How deep was excavation from ground surface? _____ "

2' separation from water table? Y N N/A

1' + soil cap over rock? ☒ Y N N/A

If soil liner used, minimum thickness is: _____ "

Embankment Lift Thickness: _____ "

Compaction Equipment: D8 Cat + Scraper Passes/Lift: _____

How was water added to embankment? Drainage + Water Truck

Approximate moisture content of soil during placing: _____ %

Concrete Storage Pond

Top soil & vegetation cleared from site? Y N N/A

Free draining base under slab Y N

Slab thickness: _____ " Reinforcement: Fiber WWF None

Waterstop installed: PVC/Rubber Betonite Tortuous Path

Wall Height _____' Wall Thickness _____' with # _____ rebar @ _____" OC

Wall backfilled with free draining material? Y N N/A

Contraction joints installed Y N Spacing: _____' x _____'

Synthetic Liner Storage Pond

Liner specs & plans approved by: ISDA NRCS Not Approved

Sand or other bedding material placed under liner Y N

Liner is: _____ one piece _____ seamed by factory personnel

Liner is: _____ UV protected _____ Capped with _____' of soil

See drawing Inside Pond Dimensions in file

Top Length _____' x Top Width _____' x Depth _____'

Bottom Length _____' x Bottom Width _____'

Inside Slope _____:1 Outside Slope _____:1 Berm Width _____'

Pond Bottom well compacted ☒ Y N

Embankments well compacted ☒ Y N

Runoff Diversions in place Y N N/A

NRCS has approved construction Y N N/A

Testing

Soil Sample Results:

Description	Clay (L/F)	Penetrometer
All sites	_____	300+
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Comments

This is a reinspection following up for lagoon #1 north lagoon to inspect the proper covering of rocks in bottom of lagoon. All rock areas have been properly capped with at least 1 foot of soil. This lagoon cell is approved for use as a waste storage lagoon.

Construction:

☒ Approved

☐ Not Approved - Action Required (see comments)

Inspector Signature

Mike Wigg

This is for lagoon #1 only

Contractor Signature

Producer Signature

October 26, 2017

Andrew Fitzgerald
Four Brothers Dairy
425 N 250 W
Shoshone, ID 83352

Subject: Pond Inspections

Mr. Fitzgerald,

At your request I have conducted a volume survey and evaluation of several wastewater containment structures at Four Brothers Dairy. During the evaluations soil samples were taken and the results are included with this report. Also, I have included location maps comments for the containment structures. The inspections do not constitute approval by the State of Idaho or Lincoln County, but may serve as verification for waste storage structure items found in the Idaho State Department of Agriculture (ISDA) Animal Waste Facility Construction Guidelines at the time of survey and inspection. For approval, you will need to contact the above mentioned government agencies.

Sincerely,

Donell Fluckiger, P.E
Fluckiger Consulting
PO Box 463
Jerome, ID 83338
(208)421-0403



Containment Structures Commentary

Evaluation Overview

Evaluations of the containment structures were conducted using an Agronomics soil probe, a 3-inch diameter AMS hand auger, and a drill with a 1/2 inch bit steel bit with a 24 inch length. Measurements were taken using a Leica Robotic Total Station. Volumes were calculated using Carlson Civil software and AutoCAD. The containment structures were checked for soil depth, compaction, bank slope, and volume. Soil samples were taken and sent to Natural Resource Solutions LLC for evaluation. This report is attached. For the report comments, depths were rounded to the nearest 0.5 foot. The width at the top of all banks exceeds 8 feet. Not all riprap and piping were installed at the time of this report. This will need to be installed before use. As always maintenance of the containment structures is the responsibility of the facility owner/operator.

Containment Volumes

The containment structures were surveyed to calculate the storage volumes. The table below shows the calculated storage volumes at full, 1 foot of freeboard, and 2 feet of freeboard.

Storage Volumes (cubic feet)			
Storage Structure	Full	1 ft Freeboard	2 ft Freeboard
Pantone 1 Runoff Pond	1,706,051	1,359,820	1,040,825
Pantone 2 Overflow Pond	542,463	453,370	369,562
Barn 4 North Evaporation Pond	471,974	378,523	288,587
Barn 1 Lagoon 2	1,558,516	1,401,351	1,251,918
Barn 2 East Lagoon 1	272,671	213,621	158,196
Barn 2 East Lagoon 2	696,591	594,472	496,648
Barn 2 East Lagoon 3	905,979	706,334	532,569

Pantone 1 Runoff Pond

The Pantone 1 Runoff Pond is located northwest of the Four Brothers Dairy Complex. It will be used for runoff collection from the compost area to the east. The clay content from the soil samples taken range from 28-32%. The maximum depth of this pond is about 9 with an average depth of about 5 feet. The average inside bank slope is 3 horizontal: 1 vertical. The outside slope is the same except for on the southeast corner where the pond bottom meets the top of the bank. The bottom of the pond is two feet or more above bedrock. Measured from the inside top of bank this structure is 76 feet from a ditch located north of the pond. Care will need to be taken not to overfill the pond.

Pantone 2 Overflow Pond

The Pantone 2 Overflow Pond is located northwest of the Four Brothers Dairy complex. It will be used for overflow water from Barn 4 North Evaporation Pond. The clay content from the soil samples taken range from 28-32%. The maximum depth of this pond is about 8.5 with an average depth of 6 feet. The average inside bank slope is 3 horizontal: 1 vertical. The outside slope is the

same except for on the south side where the hillside is used for the bank. The bottom of the pond is two feet or more above bedrock.

Barn 4 North Evaporation Pond

The Barn 4 North Evaporation Pond is an existing pond originally approved by the Idaho State Department of Agriculture December 10, 2009. The banks of this structure had been raised and a volume survey was conducted. The average depth is 5 feet. The average inside bank slope is 3 horizontal: 1 vertical. The outside slope is the same except for on the east side where the top of the bank is at about the same elevation as the ground.

Barn 1 Lagoon 2

The Barn 1 Lagoon 2 is an existing pond. According to historic photos this structure was constructed between 1999 and 2003. The clay content from the soil samples taken range from 28-29%. The structure had been cleaned before the evaluation. Some of the liner may have been removed during the cleaning process. The contractor replaced material over areas he thought needed additional soil liner. During the evaluation of this pond it was found about 18 inches of soil liner remained. The bottom of the pond and banks were still fairly well compacted. Most places exceeded 300 pounds per square inch with the penetrometer. The exception was in location where the soil was still wet. Seepage in several checked locations did not exceed 6 inches. The average inside bank slope is 2.5 horizontal: 1 vertical. The outside slope is the same except for along the canal bank. Rock riprap had been placed under the inlets. The top inside bank is about 26 feet to the water surface in the canal; however the canal bank is about 2.5 feet higher than the lagoon banks on the west and south sides. If the water to overtopped the bank, it would most likely be in the southwest corner.

Barn 2 East Lagoon 1

The Barn 2 East Lagoon 1 is a newly constructed structure located on the east side of the facility. The clay content from the soil samples taken range from 28-32%. The average depth is 4.5 feet with a maximum depth of 8 feet. The average inside bank slope is 3 horizontal: 1 vertical. The average outside bank slope is 2 horizontal: 1 vertical. The bottom was well compacted with penetrometer readings exceeding 300 pounds per square inch). The banks were found to have 4-8" of loose material in spots mostly due to dirt sluffing from constructing the banks. Underneath the loose material, the penetrometer readings exceeded 300 pounds per square inch. Although the banks are generally well compacted, it is recommended to compact the spots with loose material to strengthen the banks. At the time of evaluation riprap had been placed. There is no inlet pipe, but there is an outlet pipe to Barn 2 East Lagoon 2. The bottom of the pond is two feet or more above bedrock.

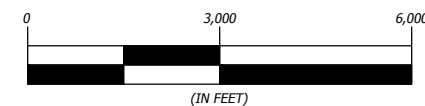
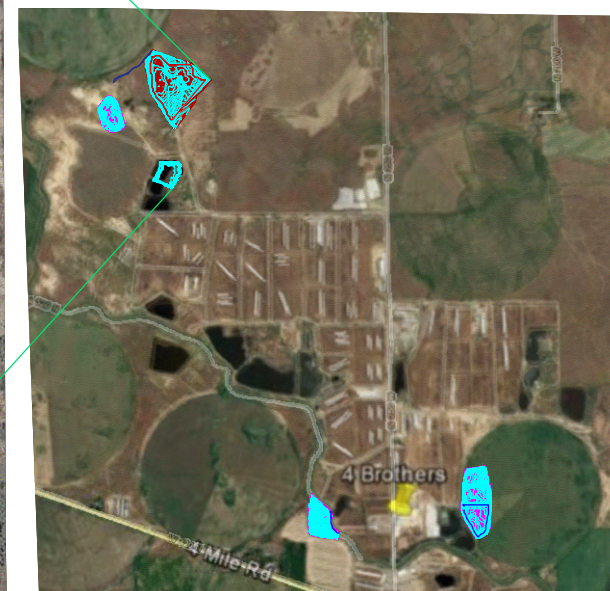
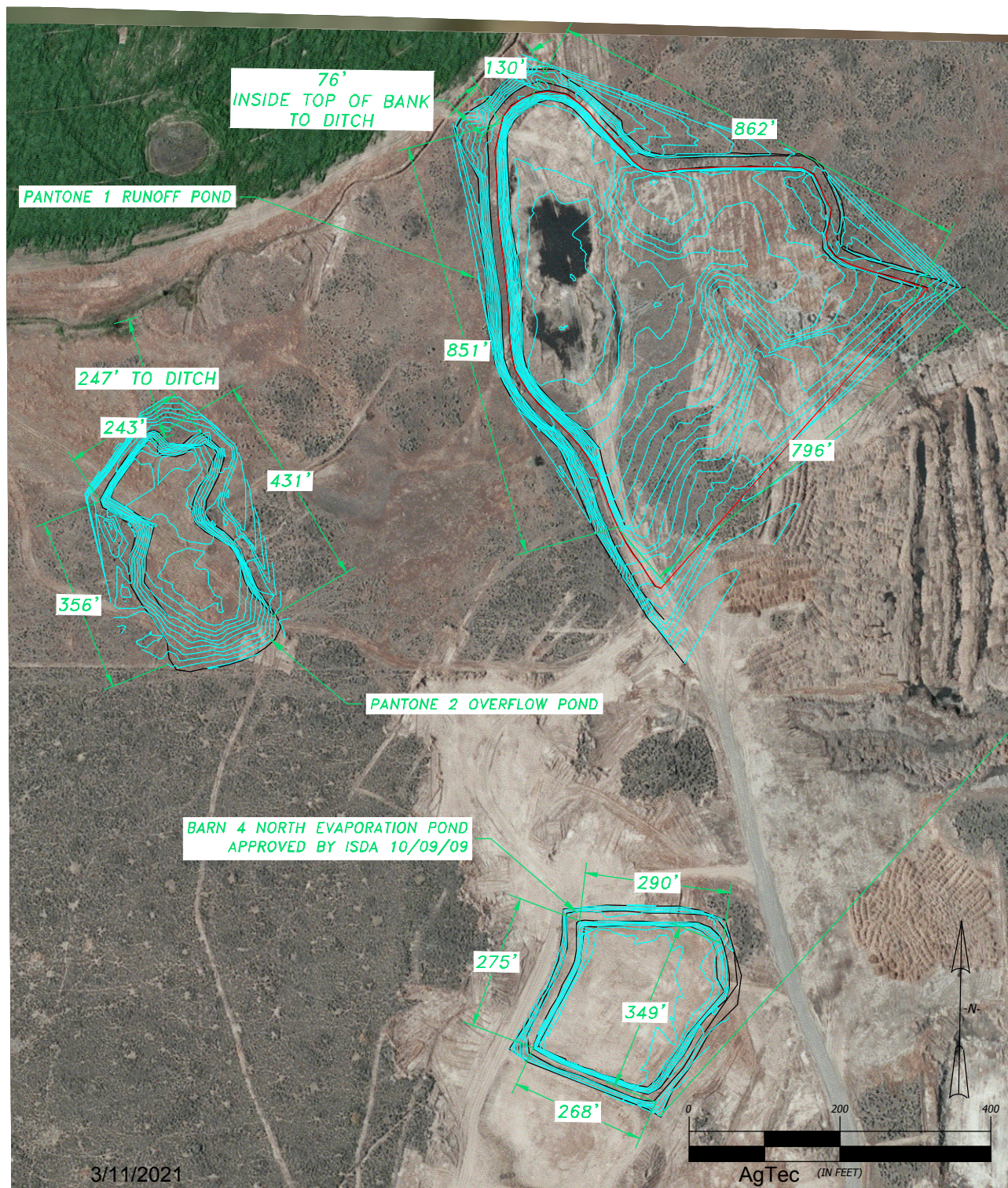
Barn 2 East Lagoon 2

The Barn 2 East Lagoon 2 is a newly constructed structure located on the east side of the facility. The clay content from the soil samples taken range from 23-26%. The average depth is 6.5 feet with a maximum depth of 11 feet. The average inside bank slope is 3 horizontal: 1 vertical. The average outside bank slope is 2 horizontal: 1 vertical. The bottom was well compacted with penetrometer readings exceeding 300 pounds per square inch). The banks were found to have 4-8" of loose material in spots mostly due to dirt sluffing from constructing the banks. Underneath

the loose material, the penetrometer readings exceeded 300 pounds per square inch. Although the banks are generally well compacted, it is recommended to compact the spots with loose material to strengthen the banks. At the time of evaluation riprap had been placed under the inlet pipe. The bottom of the pond is two feet or more above bedrock.

Barn 2 East Lagoon 3

Barn 2 East Lagoon 3 is a newly constructed structure located on the east side of the facility. The clay content from the soil samples taken range from 20-23%. The average depth is 6.5 feet with a maximum depth of 10.5 feet. The average inside bank slope is 3 horizontal: 1 vertical. The average outside bank slope is 2 horizontal: 1 vertical. The bottom was well compacted with penetrometer readings exceeding 300 pounds per square inch. The banks were found to have 4-8" of loose material in spots mostly due to dirt sluffing from constructing the banks. Underneath the loose material, the penetrometer readings exceeded 300 pounds per square inch. Although the banks are generally well compacted, it is recommended to compact the spots with loose material to strengthen the banks. At the time of evaluation riprap and inlet pipe had not been placed. On October 11, 2017 during evaluation a portion of the bottom on the west side needed another foot of clay liner. This was addressed with the contractor and has been covered with the required soil liner. This portion was evaluated again on October 25, 2017 for verification.





OVERFLOW POND NORTH VIEW



ORTH VIEW



EST VIEW FROM

October 25, 2017

HARLEY R. NOE
Phone: 208.850.4926
Fax: 208.939-8602

Donell Fluckiger
Fluckinger Consulting
P.O. Box 463
Jerome, ID 83338-0463

RE: Grab samples from 4 Brothers Dairy

I have evaluated the 21 samples you provided me from the 4 Brothers Dairy located at 425 N, 250 W north of Shoshone. The samples were collected from 6 different locations on the dairy. A map is attached which you created that shows the sampling points. The samples were silt loams and silty clay loams with clay contents ranging from 20 to 32 percent. The table below shows the named 6 sample locations, number of samples at that point, texture and clay content range for that location.

<i>Sample ID (as marked on bag)</i>	<i># of samples</i>	<i>Observed Texture</i>	<i>Estimated Clay</i>
Barn 1, Lagoon 2	2	silty clay loam	28 to 29%
Pantone #1	4	silty clay loam	28 to 32%
Pantone #2	3	silty clay loam	28 to 32%
East Lagoon #1 (north)	4	silty clay loam	28 to 32%
East Lagoon #2 (center)	4	silt loam	23 to 26%
East Lagoon #3 (south)	4	loam to silt loam	20 to 23%

All the textures and clay contents are well within the requirements for soils to be used as earthen liners. Once placed, wetted and compacted they will form a positive seal that will prevent loss of liquid from ponds or lagoons. You need to confirm that appropriate compaction is present for these soils in place.

I will forward a copy of this report to the dairy for their records. If you have any questions please call me at (208) 850-4926 or by e-mail at harleynoe@cableone.net.

transmitted via e-mail

HARLEY R. NOE
Professional Soil Scientist

cc w/ attachments: 4 Brothers Dairy, 425 Three Mile Road West, Shoshone, ID 83352

November 27, 2017

Andrew Fitzgerald
Four Brothers Dairy
425 N 250 W
Shoshone, ID 83352

Subject: Pond Inspections

Mr. Fitzgerald,

At your request I have conducted a volume survey and evaluation of the Barn 2 East Runoff Pond and Andy's Pond containment structures at Four Brothers Dairy. During the evaluations soil samples were taken and the results are included with this report. Also, I have included location maps comments for the containment structures. The inspections do not constitute approval by the State of Idaho or Lincoln County, but may serve as verification for waste storage structure items found in the Idaho State Department of Agriculture (ISDA) Animal Waste Facility Construction Guidelines at the time of survey and inspection. For approval you will need to contact the above mentioned government agencies.

Sincerely,

Donell Fluckiger, P.E
Fluckiger Consulting
PO Box 463
Jerome, ID 83338
(208)421-0403



Containment Structures Commentary

Evaluation Overview

Evaluations of the containment structures were conducted using an Agronomics soil probe, a 3-inch diameter AMS hand auger, and a drill with a 1/2 inch bit steel bit with a 24 inch length. Measurements were taken using a Leica Robotic Total Station. Volumes were calculated using Carlson Civil software and AutoCAD. The containment structures were checked for soil depth, compaction, bank slope, and volume. Soil samples were taken and sent to Natural Resource Solutions LLC for evaluation. This report is attached. For the report comments, depths were rounded to the nearest 0.5 foot. The width at the top of all banks exceeds 8 feet. Riprap and piping have been installed. Additional riprap should be installed as needed. As always maintenance of the containment structures is the responsibility of the facility owner/operator.

Containment Volumes

The containment structures were surveyed to calculate the storage volumes. The table below shows the calculated storage volumes at full, 1 foot of freeboard, and 2 feet of freeboard.

Storage Volumes (cubic feet)			
Storage Structure	Full	1 ft Freeboard	2 ft Freeboard
Barn 2 East Runoff	125,942	77,249	40,720
Andy's Runoff Pond	74,078	62,616	52,554

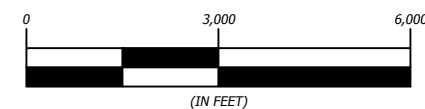
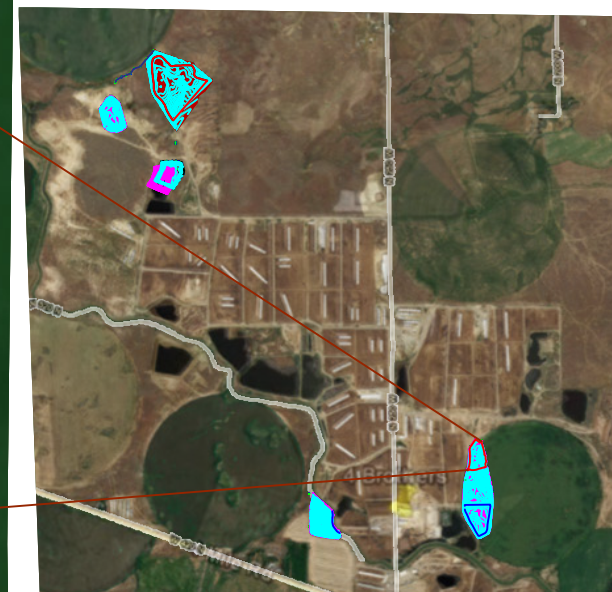
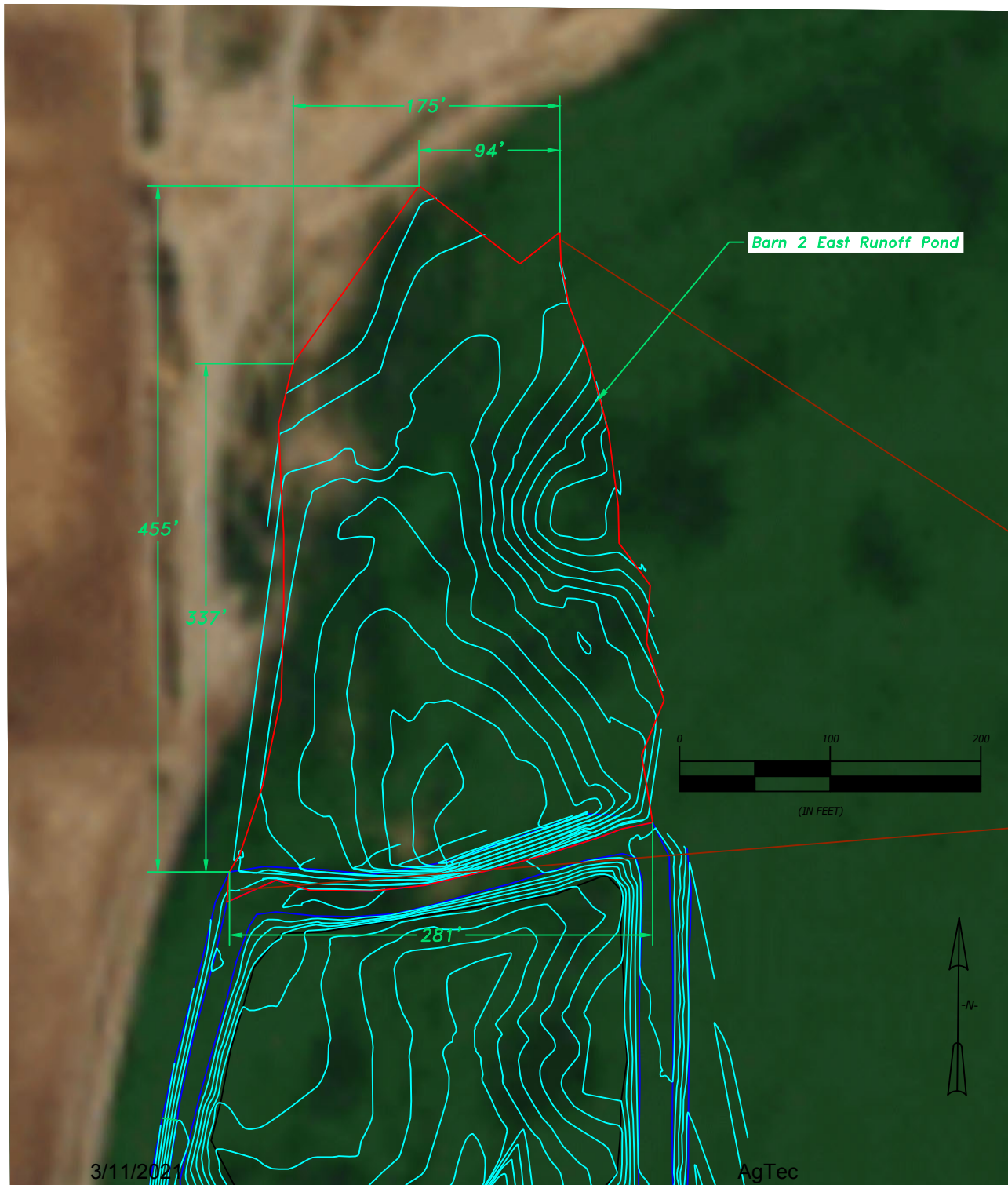
Barn 2 East Runoff Pond

The Barn 2 East Runoff Pond is located on the north side of Barn 2 East Lagoon 1. It will be used for runoff collection from the corrals north of the runoff pond. The clay content from the soil samples taken range from 20-26%. The maximum depth of this pond is about 5.5 feet. The maximum inside bank slope is 2 horizontal: 1 vertical located on the south bank shared with Barn 2 Lagoon 1. The bottom of the pond is two feet or more above bedrock. Overflow from the pond will be pumped into Barn 2 Lagoon 1. All tested locations exceeded 300 pounds per square inch with the penetrometer.

Andy's Pond

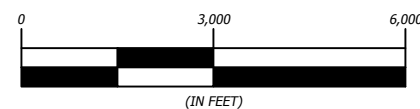
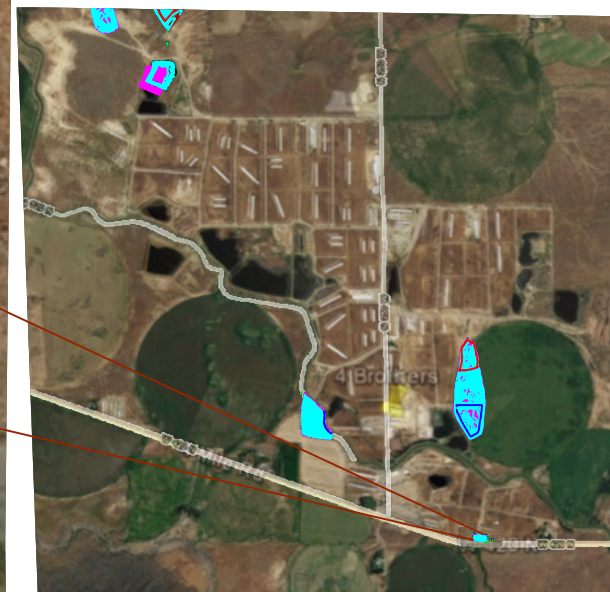
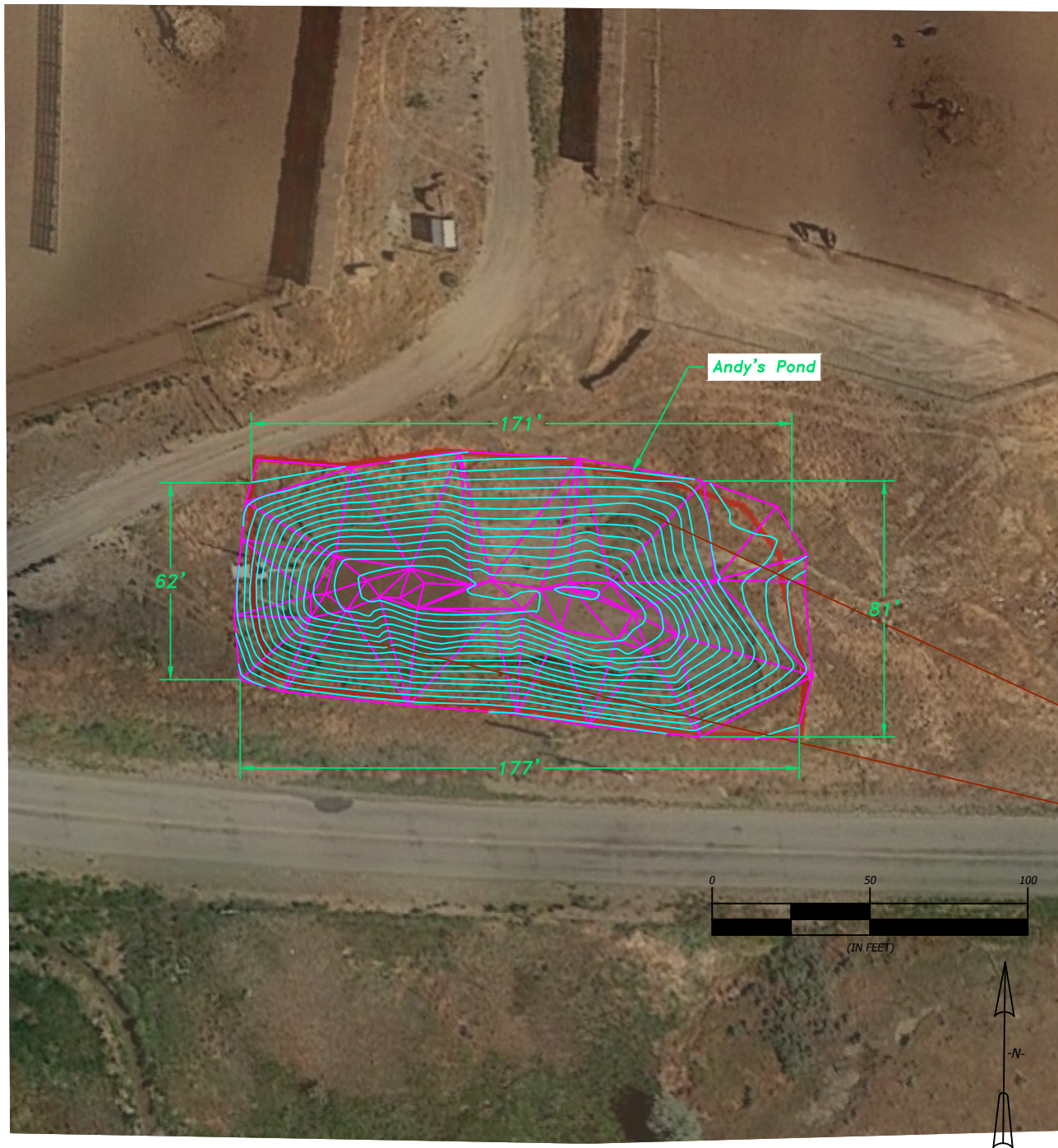
Andy's Pond is located southeast of the Four Brothers Dairy complex. It will be used for runoff collection from heifer corrals. The clay content from the soil samples taken range from 22-26%. This pond is shown as SE Runoff Pond in the Natural Resource Solutions LLC report. The maximum depth of this pond is about 13 feet. The average inside bank slope is approximately 2 horizontal: 1 vertical. This structure is completely in the ground. The bottom of the pond is two feet or more above bedrock. All tested locations exceeded 300 pounds per square inch with the penetrometer.

FOUR BROTHERS DAIRY
425 N 250 W
SHOSHONE, ID



FLUCKIGER
CONSULTING
ENGINEERING &
ENVIRONMENTAL

FOUR BROTHERS DAIRY
425 N 250 W
SHOSHONE, ID



FLUCKIGER
CONSULTING
ENGINEERING &
ENVIRONMENTAL



BARN 2 EAST RUNOFF POND—WEST PANORAMA VIEW



ANDY'S POND—VIEW FROM NORTH CORNER

November 15, 2017

HARLEY R. NOE
Phone: 208.850.4926
Fax: 208.939-8602

Donell Fluckiger
Fluckinger Consulting
P.O. Box 463
Jerome, ID 83338-0463

RE: 11-14-17 grab samples from 4 Brothers Dairy

I have evaluated the 6 samples you provided me from the 4 Brothers Dairy located at 425 N, 250 W north of Shoshone. The samples were collected from 2 individual ponds on the dairy. A map is attached which you created that shows the sampling points. The following table provides the textures and clay contents.

<i>Sample ID (as marked on bag)</i>	<i>Observed Texture</i>	<i>Estimated Clay</i>
East Runoff Pond - NW	silt loam	20 to 22%
East Runoff Pond - SW	silt loam	24 to 26%
East Runoff Pond - NE	silt loam	24 to 26%
East Runoff Pond - SE	loam to silt loam	20 to 22%
SE Runoff Pond - east bottom	silt loam	24 to 26%
SE Runoff Pond - west bottom	silt loam	22 to 24%

All of the observed textures will work well as earthen liners when properly compacted. Once you have determined that compaction is adequate, these runoff ponds should be considered approved. Please pass this information on to the ISDA inspector.

I will forward a copy of this report to the dairy for their records. If you have any questions please call me at (208) 850-4926 or by e-mail at harleynoe@cableone.net.

transmitted via e-mail

HARLEY R. NOE
Professional Soil Scientist

cc w/ attachments: 4 Brothers Dairy, 425 Three Mile Road West, Shoshone, ID 83352

5740 N. APPLEBROOK WAY

BOISE, IDAHO

83713

December 10, 2018

Andrew Fitzgerald
Four Brothers Dairy
425 N 250 W
Shoshone, ID 83352

Subject: Pond Inspections

Mr. Fitzgerald,

At your request I have conducted a volume survey and evaluation of several wastewater containment structures at Four Brothers Dairy. During the evaluations soil samples were taken and the results are included with this report. Also, I have included location maps comments for the containment structures. The inspections do not constitute approval by the State of Idaho or Lincoln County, but may serve as verification for waste storage structure items found in the Idaho State Department of Agriculture (ISDA) Animal Waste Facility Construction Guidelines at the time of survey and inspection. For approval, you will need to contact the above mentioned government agencies.

Sincerely,

Donell Fluckiger, P.E
Fluckiger Consulting
PO Box 463
Jerome, ID 83338
(208)421-0403



Containment Structures Commentary

Evaluation Overview

Evaluations of the containment structures were conducted using an Agronomics soil probe, a 3-inch diameter AMS hand auger, and a drill with a 1/2 inch bit steel bit with a 24 inch length. Measurements were taken using a Leica Robotic Total Station. Volumes were calculated using Carlson Civil software and AutoCAD. The containment structures were checked for soil depth, compaction, bank slope, and volume. Soil samples were taken and sent to Natural Resource Solutions LLC for evaluation and indicate the percentage of clay ranges from 28-32%. This report is attached. For the report comments, depths were rounded to the nearest 0.5 foot. The width at the top of all banks exceeds 8 feet. Riprap has been installed on these ponds. As always maintenance of the containment structures is the responsibility of the facility owner/operator.

Containment Volumes

The containment structures were surveyed to calculate the storage volumes. The table below shows the calculated storage volumes at full, 1 foot of freeboard, 2 feet of freeboard, bank slope, and top of bank width.

CONTAINMENT SUMMARY			BANK WIDTH(FT)	INSIDE SLOPE H:1V	OUTSIDE SLOPE H:1V	
POND	FREEBOARD (FT)	VOLUME (CF)	MIN.	AVERAGE	AVERAGE	DEPTH (FT)
STOCKYARD 2	FULL	548,440	12	2.5	2.5	10
STOCKYARD 2	1'	451,982	12	2.5	2.5	10
STOCKYARD 2	2'	284,040	12	2.5	2.5	10
STOCKYARD 4	FULL	476,586	10	3.5	2.5	6.5
STOCKYARD 4	1'	368,994	10	3.5	2.5	6.5
STOCKYARD 4	2'	266,712	10	3.5	2.5	6.5
POND 45	FULL	966,229	10	3	2	12
POND 45	1'	838,668	10	3	2	12
POND 45	2'	717,955	10	3	2	12

Stockyard 2 Runoff Pond

The Stockyard 2 Runoff Pond is located east of Barn 2. It will be used for runoff water from the compost area located just northwest of this pond. The deepest pond depth is approximately 10 feet. The outside bank slope range from 1.6H:1V to 3.5H:1V and the inside bank slope ranges from 2.5H:1V to 3.4H: 1V. The minimum top of bank is 12 feet. The bottom of the pond is two feet or more above bedrock.

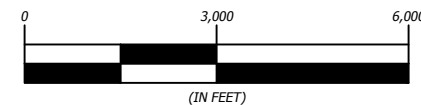
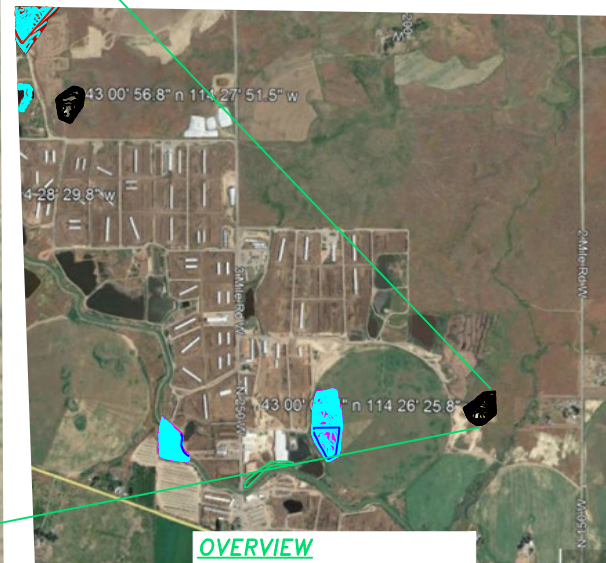
Stockyard 4 Runoff Pond

The Stockyard 4 Runoff Pond is located northwest of Barn 4. It will be used for runoff water from the compost area located just north of this pond. The deepest pond depth is approximately 6.5 feet. The outside bank slope range from 2H:1V to 3H:1V and the inside bank slope ranges from 3H:1V to 4H: 1V. The minimum top of bank is 10 feet. The outside slope is the same except for on the east side where the hillside is used for the bank. The bottom of the pond is two feet or more above bedrock.

Pond 45

The Pond 45 is a new pond for emergency overflow from Barn 4 and is located west of Barn 4. The low top of the bank is on the northeast side. The deepest pond depth is approximately 12 feet. The outside bank slope range from 1.6H:1V to 2.5H:1V and the inside bank slope ranges from 2.5H:1V to 3.4H: 1V. The minimum top of bank is 10 feet. The bottom of the pond is two feet or more above bedrock.

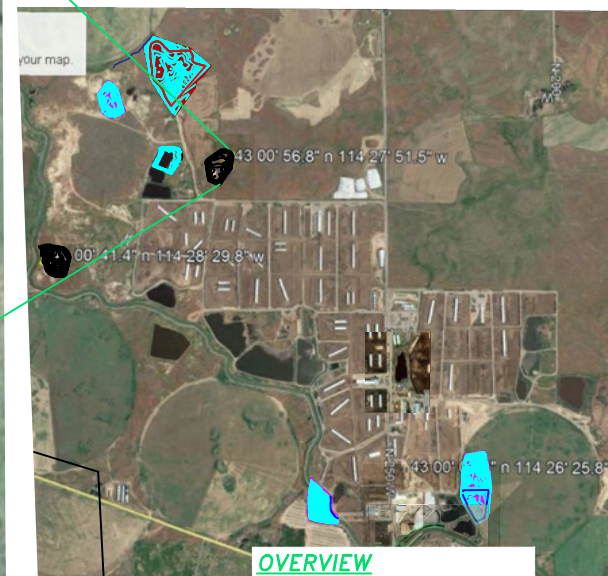
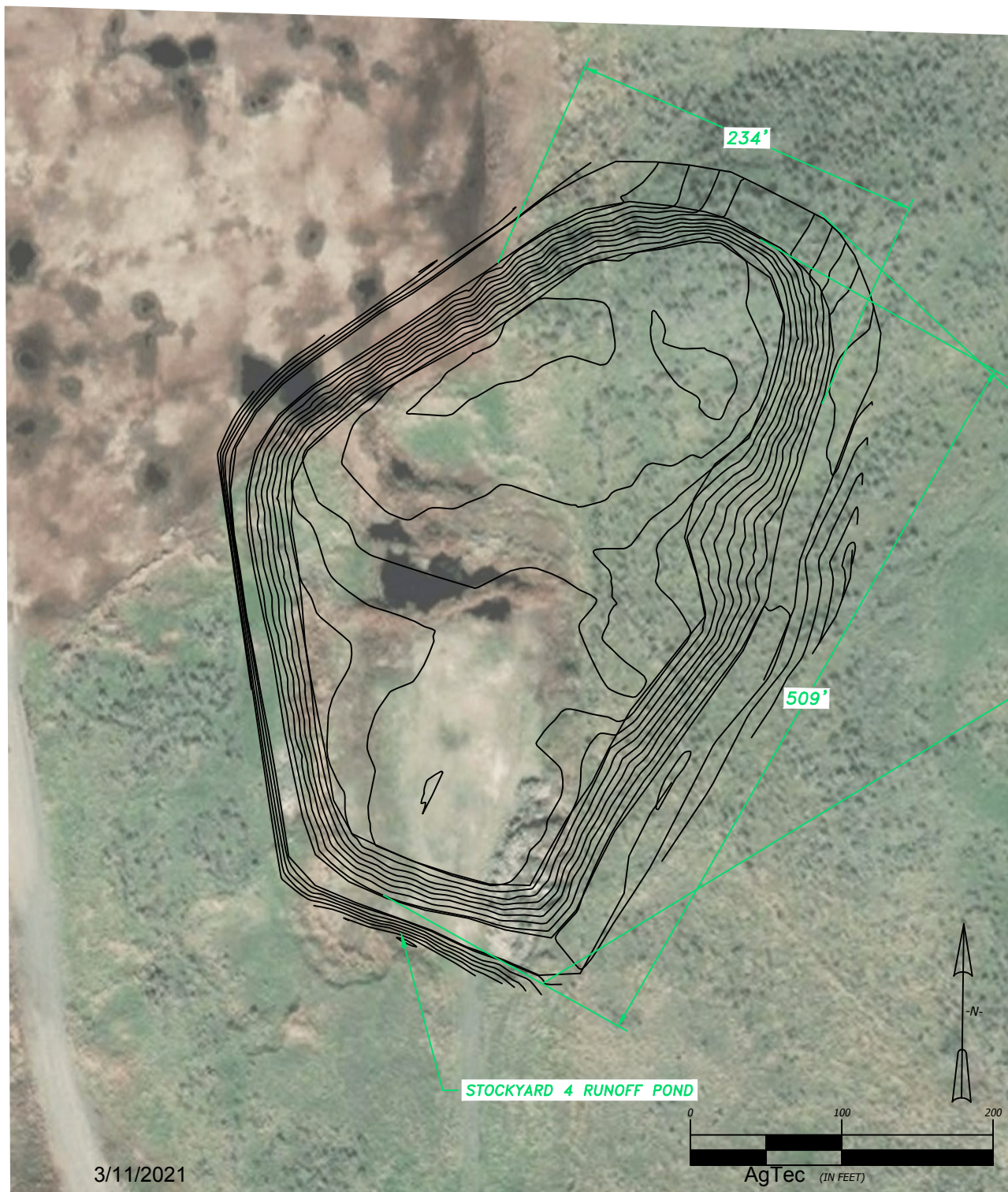
FOUR BROTHERS DAIRY
425 N 250 W
SHOSHONE, ID



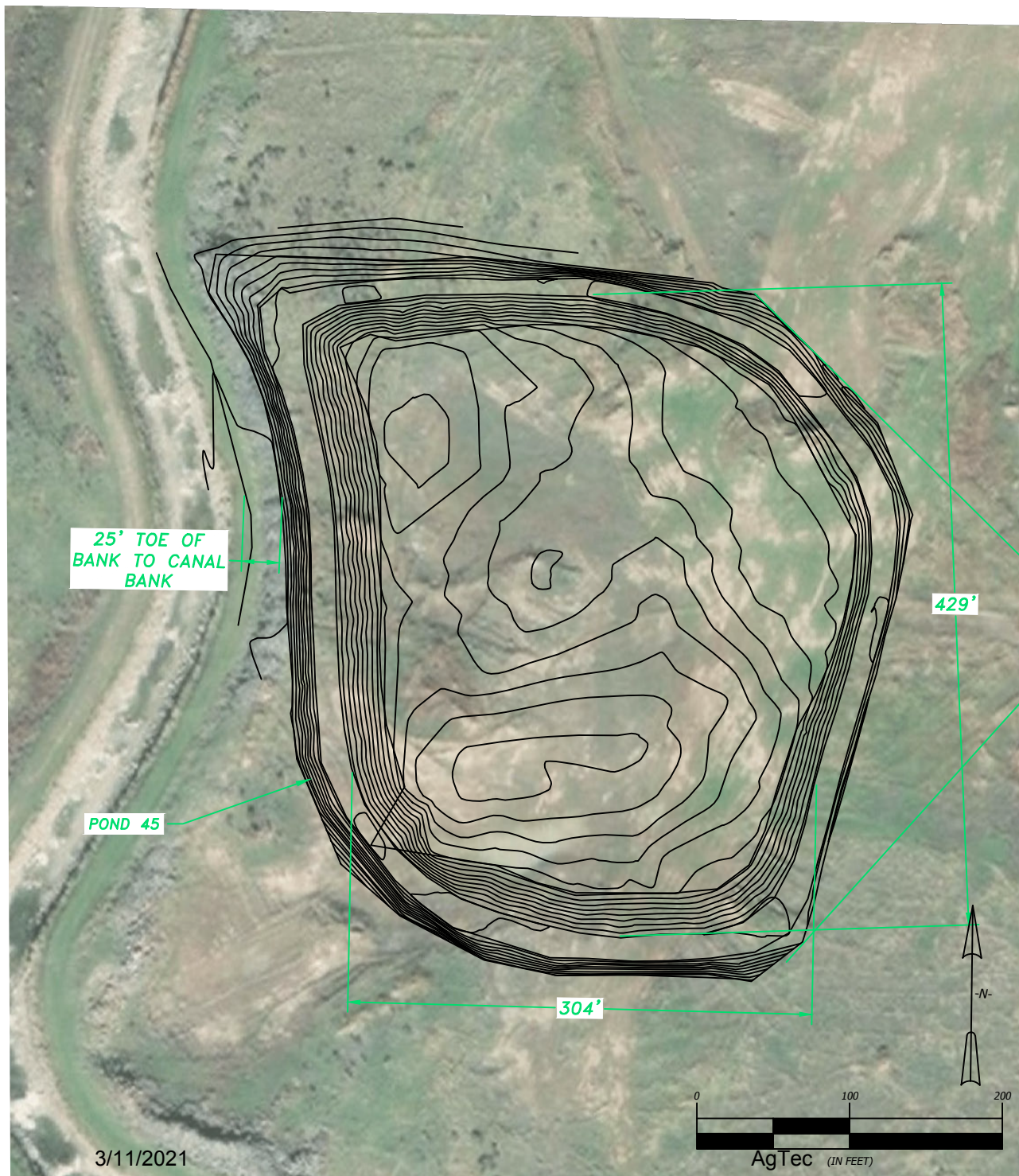
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Page 154

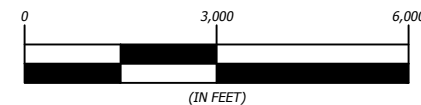
FOUR BROTHERS DAIRY
425 N 250 W
SHOSHONE, ID



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SOUTHWEST VIEW



November 26, 2018

HARLEY R. NOE
Phone: 208.850.4926
Fax: 208.939-8602

Donell Fluckiger
Fluckinger Consulting
P.O. Box 463
Jerome, ID 83338-0463

RE: 11-21-18 grab samples from 4 Brothers Dairy

I have evaluated the 12 samples you provided me from the 4 Brothers Dairy located at 425 N, 250 W north of Shoshone. The samples were collected from five pond locations on the dairy complex. A copy of your map is attached which shows the pond locations.

The samples were consistent silty clay loam textures and contained from 28 to 32 percent clay. These findings compare closely with samples you provided from another pond in December of 2017 and with two locations that I field checked on June 6th of last year.

All of the observed textures will work well as earthen liners when properly compacted. Once you have determined that compaction is adequate, this runoff pond should be considered approved. Please pass this information on to the ISDA inspector.

I will forward a copy of this report to the dairy for their records. If you have any questions please call me at (208) 850-4926 or by e-mail at harleynoe@cableone.net.

transmitted via e-mail

HARLEY R. NOE
Professional Soil Scientist

cc w/ attachments: 4 Brothers Dairy, 425 Three Mile Road West, Shoshone, ID 83352

CONSTRUCTION INSPECTION REPORT

FACILITY NAME/OWNER/ADDRESS/CITY/PHONE

Four Bro. Dairy
425 N. 250th Shoshone, ID

Site:

DATE:

5-14-15

TIME:

12:20pm

CONTRACTOR:

Yayiv Weber

PHONE:

324-9256

INSPECTION TYPE:

☐ DURING CONSTRUCTION

☒ FINAL

Facility meets the following siting requirements:

- | | | | |
|--|----------------------------------|---|-----|
| 1. 100' or more from a stream or drain | <input checked="" type="radio"/> | N | N/A |
| 2. 100' from a private domestic well | <input checked="" type="radio"/> | N | N/A |
| 3. 1000' from a public well | <input checked="" type="radio"/> | N | N/A |
| 4. 100' from any residence | <input checked="" type="radio"/> | N | N/A |

Soil Analysis Completed by: NRCS Lab N/A

Limiting Soil Depth: by Rock? Water? Soil?

Liner Required? Y N

Clay content of soil or soil liner: 21%

Maximum Excavation Depth Allowed:

Has facility been properly sized? Y N

by: NRCS

ISDA

U OF I

OTHER Fluckiger

Earthen Storage Pond

Top soil & vegetation cleared from site? ☒ N N/A

Excavation Equipment used:

Core trench installed Y N N/A

Rock encountered during excavation: None Bedrock "Floaters" Gravel

Soil consistent with analysis Y N N/A

How deep was excavation from ground surface?

2' separation from water table? Y N N/A

1' + soil cap over rock? Y N N/A

If soil liner used, minimum thickness is: "

Embankment Lift Thickness: "

Compaction Equipment: Passes/Lift:

Approximate moisture content of soil during placing:

Concrete Storage Pond

Top soil & vegetation cleared from site? Y N N/A

Free draining base under slab Y N

Slab thickness: " Reinforcement: Fiber WWF None

Waterstop installed: PVC/Rubber Betonite Tortuous Path

Wall Height Wall Thickness " with # rebar @ " OC

Wall backfilled with free draining material? Y N N/A

Contraction joints installed Y N Spacing: ' x '

Synthetic Liner Storage Pond

Liner specs & plans approved by: ISDA NRCS Not Approved

Sand or other bedding material placed under liner: Y N

Liner is: one piece seamed by factory personnel

Liner is: UV protected capped with ' of soil

Inside Pond Dimensions

Top Length 477' x Top Width 424' x Depth 8'

Bottom Length ' x Bottom Width '

Inside Slope 2:1 Outside Slope 1:1 Berm Width '

Earthen Berming

Runoff Diversion Berms/Ditches in place: Y N

Runoff Containment Berms in place: Y N

Berm Construction is adequate: Y N

Berm height '

Testing

Soil Sample Results:

Description	Clay (L/F)	Penetrometer
NW corner	20% 22%	
NE corner	22% 24%	

Comments

This inspection does not constitute county approval of this facility. Consult your county planning department regarding additional county requirements.

lagoon meets ISDA Requirements.
Riprap in place, sides and Bottom of
lagoon compacted well.

Construction:

☒ Approved

☐ Not Approved - Action Required (see comments)

Inspector Signature

Aime Blahely

Contractor Signature

Producer Signature

RECEIVED

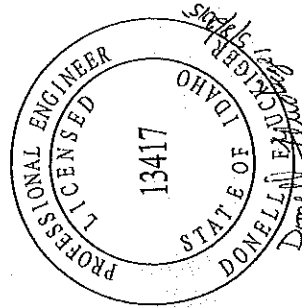
MAY 20 2015

DAIRY BUREAU

NOTES:

- *THE CONTAINMENT POND MEETS ISDA CONSTRUCTION REQUIREMENTS.
- *THE CONTAINMENT AREA WILL SERVE AS ADDITIONAL APPROVED STORAGE FOR THE FACILITY.
- *AT LEAST 2' COVER OVER BEDROCK.
- *THE NATIVE SOIL FROM THE POND RANGE FROM 20-26% CLAY. (SEE ATTACHMENT)
- *THE POND IS COMPACTED EXCEEDING 300 PSI WITH THE COMPACTION TESTER.
- *INSIDE BANK SLOPE IS 3H:1V OR GREATER.
- *OUTSIDE BANK SLOPE IS 2H:1V.
- *TOP OF BANK MINIMUM IS 12'.
- *DELIVERY PIPE CROSS THE CANAL AND ENTERS THE POND ON NORTHEAST CORNER.
- *MEASUREMENTS AND VOLUMES CALCULATED USING LEICA ROBOTIC TOTAL STATION AND CARLSON CIVIL CAD SOFTWARE.
- *PRODUCER/OWNER SHALL MAINTAIN THE DELIVERY PIPE AND POND WHICH INCLUDES PERIODIC INSPECTION, WEED CONTROL, CLEANING AND EROSION CONTROL

CONTAINMENT POND STORAGE	
FREEBOARD (FT)	CAPACITY (CF)
FULL	1,627,537
1	1,374,310
2	1,134,299
≈ 11' MAX POND DEPTH MEASURED NEAR SOUTHWEST CORNER	

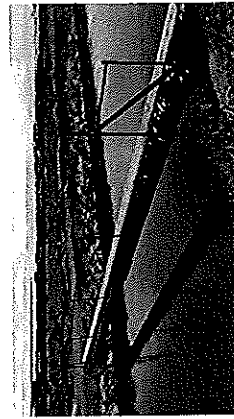


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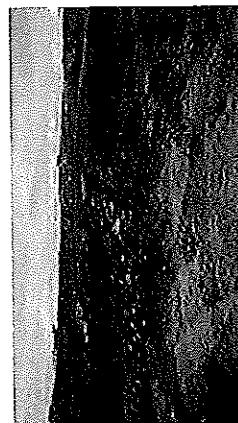
SOUTHWEST PANORAMA POND VIEW



PIPE CROSSING CANAL
SOUTHWEST VIEW



PIPE CROSSING CANAL
SOUTHEAST VIEW



PIPE AND RIPRAP IN
NORTHEAST CORNER